

A Dynamical Model of Multicultural Integration

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Abstract

In this dissertation, the conception, development, computer simulation and empirical testing of a dynamical model of multicultural integration are presented. The purpose of this model is to shed light on the dynamical social processes by which the beliefs and behaviors of individual people over time come to shape complex patterns of social relations in culturally plural societies. The model is primarily based on Berry's model of acculturation, but goes beyond it in important ways, by including individual differences and allowing the representation of processes of individual change. First the assumptions of the model are examined by means of computer simulation and empirical testing. Then, the properties of the model are analyzed in detail with the help of three series of simulation studies of increasing complexity. Finally, large scale survey data are compared to some simulation results, and are used to place the dynamical model, and acculturation research in general, in a broader context.

Keywords: multicultural integration, acculturation, intergroup relations, multiculturalism, multicultural society, dynamical model, computer simulation, computer modeling, dynamic systems theory

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Chapter 1

Introduction

Multicultural integration is one of the biggest challenges to social sustainability in Western societies today. Recent mass migration has transformed the ethno-cultural make-up of most Western countries and turned them into multicultural societies. Typically ten percent of the total population of these nations or more is now of non-Western origin (Castles & Miller, 2009; van Oudenhoven, Ward & Masgoret; 2006). Because minorities are often concentrated in urban areas however, it is not uncommon that large metropolitan areas consist for one third out of citizens of non-Western origin, and even for minorities to locally outnumber the “majority” altogether (Bolt, Hooimeijer & van Kempen, 2002; Simpson & Finney, 2009; Walks & Bourne, 2006). It is clear that the sudden influx of such large numbers of minorities has a deep and lasting impact on societies.

The reactions of majority groups to these changes vary, but overall the support for multiculturalism has been limited, and is declining for already at least a decade. Anti-immigrant sentiments often play an important role in public and political debates and decision making. Many countries now have political parties that are organized primarily around a discourse of anti-multiculturalism (Castles & Miller, 2009; Lubbers, Gijsberts & Scheepers, 2002; Pettigrew, 1998b; Rydgren, 2007). Examples include Geert Wilders’ PVV in the Netherlands, which was the second largest party in the last parliamentary elections, the Front National of Marine le Pen in France, supported by a third of the electorate, and the party Golden Dawn in Greece, who openly make use of fascist symbols and do not hide their admiration for the Nazi Party and Adolf Hitler.

In addition to concerns of majority groups, we have witnessed various episodes of social unrest among minorities, such as in France, England, Brussels in Belgium and Sydney, Australia. These events were not coincidences: these riots were an outburst of anger and frustration in response to poor living conditions, generally disadvantaged social positions and discrimination (Waddington & King, 2009). Also, the radicalization of minority youth has become a concern over the past decade or so, as this process has been linked to threats of “homegrown” terrorism (Crone & Harrow, 2011; Precht, 2007; Sageman, 2004; Silber & Bhatt 2007; Smelser, 2009).

The challenges posed by multiculturalism are formidable indeed. The multicultural make-up of societies is now a fact that cannot be denied or undone. If we assume that sustainable peace and absence of conflict are major goals for all societies, then ways of living together must be found. So far, countries have responded with different approaches to immigration and cultural plurality. Specific responses can often be traced back to historical philosophical and political traditions unique to each country; the results of which have been mixed. Strategies of assimilation (as in France) or segregation (as initially in Germany) do not seem to be particularly instrumental in bringing about the required social conditions that make people feel content with the multicultural society. Countries endorsing a supportive approach to multiculturalism (as in the UK and the Netherlands) do overall fare a bit better, but they as well had their share of problems and now experience declining support for multiculturalism amongst the population (Castles & Miller, 2009).

It is clear that we are urgently in need of a comprehensive understanding of how to successfully guide our societies through this transition towards long-term cultural pluralism. Unfortunately, the social sciences so far have not been able to provide this kind of knowledge. Political debates and policy decisions appear to be based more on emotions than on understanding of the problems and their possible solutions. This is not to say that no good

theories have been developed. The problem is that theories are developed in a piecemeal fashion, from different perspectives, by different and largely disconnected scientific disciplines. Undoubtedly this is mainly because of the inherent complexity of the issue and because it covers different levels of analysis that are typically studied by different disciplines such as sociology, psychology, economics, etc.

Obviously, the answers and solutions to all these practical and theoretical issues cannot be provided in the two hundred or so pages of this thesis. However, this work does aim to contribute in two specific ways. First, by adopting an approach that is motivated by real-world problems, with the aim of trying to bridge the gap between reality and theory. A lot of theory has been developed for the sake of theory development; out of curiosity or interest in specific phenomena, or in response to earlier theory. This is part of normal and healthy scientific practice. But, in addition to this, it is my strong feeling that given the societal context, social scientists should be a bit more responsive to the piercing questions that are forced upon us by reality.

The second way in which this work attempts to contribute is by developing a model that is sensitive to the complexity of the issues at hand, and that will be an example of an integrative approach that has the potential for connecting and combining knowledge and theory from different scientific disciplines. Multiculturalism is a heatedly debated topic. Arguments are often based on moral and ideological principles, framed in terms of good and bad or should and should not. In this work, I will try to follow a functional approach as much as possible, but with a topic like this it is impossible to avoid moral questions altogether. One question that immediately presents itself is how functionality can be defined. The definition that I use in this work is based on human suffering: anything that abates or prevents human suffering over the long term will be considered functional.

The need for multicultural integration

If diverse people are to live harmoniously in the same society, a certain degree of socio-cultural integration of ethno-cultural minorities is desirable. This is not an ideological statement, but a practical one. There are specific cases, in countries that are home to indigenous peoples, where segregation is the preferred way of living “together”. However, this is hardly ever preferred in the context of recent immigration (see Berry, 1997 for instance), because segregation is often linked to negative social consequences (Musterd, 2005) and even conflictual situations (Brewer, 1999), as for instance in France, the Netherlands, or Germany (Castles & Miller, 2009). Also, from a different perspective, research on the relationship between social capital and conflict has pointed out that social integration between groups is crucial in the prevention and resolution of conflict (Colletta & Cullen, 2000; Putnam, 1993).

If people of different ethnicities and cultures are to harmoniously walk the same streets, shop in the same shops, go to the same schools and vote in the same elections, then there needs to be some mutual agreement on the values and norms that can make a pluralistic society function. There needs to be some degree of acceptance of the other being different. But above all there needs to be contact and communication that makes this all possible. In practically all societies that are home to different ethno-cultural groups, a certain degree of multicultural integration is needed. The extent, the specific form that this takes, and the way to achieve this must be decided upon or negotiated by the parties involved.

These parties however are not monolithic, or homogeneous. In everyday language, groups are often identified as being the actors in culturally plural societies, but multicultural or socio-cultural integration happens between people, not between groups. People meet and interact in shops, at work, in school, or during leisure time. Some contacts may be instrumental in creating mutual understanding, others may develop into friendships, and some

may be conflictual. Whatever the specific outcome, we are dealing with interindividual social processes.

Recognizing that integration happens between individuals does not imply that aggregate levels do not exist or are unimportant. For instance, people's identity or feeling of belonging is often rooted in group membership, and when trying to make sense of social reality people often think in terms of groups (Brewer, 1979; Tajfel, 1982; Tajfel & Turner, 1979). Also, when we want to understand or describe societies, explanations and descriptions of the individual level would not suffice. An intriguing question, then, is how the individual and the aggregate levels are related. Societies consist of individuals whose actions and decisions somehow shape it, but the way in which this happens is elusive.

Multicultural integration is a complex, dynamic and ongoing social process which is difficult to fathom. It is multifaceted and--unsurprisingly--there is no single comprehensive model or theory that captures its entire complexity. Rather, from all strands of the social sciences there are models and theories that directly or indirectly explain important aspects of multicultural integration. A discussion of some of the most important ones is provided here because it helps to define the field of study related to multicultural integration, it shows the current state of the art in this discipline, and it helps us to identify the strengths and shortcomings of these approaches. I limit myself to theories within the domain of (social) psychology and will pay less attention to approaches from the fields of anthropology, ethnic and migration studies, sociology, geography, economics, political sciences and philosophy, although the boundaries may not always be clear, and at times influences from these fields permeate the present work.

Psychology of intergroup relations and the contact hypothesis

Multicultural integration happens between individuals belonging to different ethno-cultural groups, and “whenever individuals belonging to one group interact, collectively or individually, with another group or its members in terms of their group identification, we have an instance of intergroup behavior” (Sherif, 1966, p.12). Even though ethnical and cultural differences are not necessarily implied, Sherif’s statement leaves no doubt that multicultural integration falls within the domain of the social psychology of intergroup relations. The amount of research in this field is vast and diverse, but organized around several defining themes.

At the individual level, people have perceptions and beliefs about themselves, the group they belong to, and about other groups and their members. Research on cognitive processes has focused on category formation, e.g., how group impressions are formed on the basis of interaction with individuals, and, along similar lines, how stereotypes are formed (Rothbart, Fulero, Jensen, Howard & Birrell, 1978; Tajfel, 1981). Stereotypes may be accompanied by prejudice, and often include affective and evaluative components that form important parts of people’s attitudes (Ajzen, 2001; Brewer & Kramer, 1985; Dijker, 1987; Quillian, 1995). Attitudes can be conscious (explicit), or unconscious (implicit) and people may even hold conflicting attitudes at the same time (Dovidio, Kawakami & Gaertner, 2002; Dovidio, Kawakami, Johnson, Johnson & Howard, 1997).

Being a group member influences the kind of cognitions people have. Because group membership is an important aspect of people’s (social) identity, one’s thoughts about the ingroup and outgroups are closely tied to feelings of worth and self-esteem (Hagendoorn, 1993; Tajfel & Turner, 1979). One phenomenon that has received a lot of attention is ethnocentrism or ingroup favoritism--placing higher value on characteristics of the ingroup, which serves the purpose of maintaining a positive self-image. However, ethnocentrism does

not have to entail a more positive view of the ingroup; members of lower status groups may develop more favorable views of a higher status outgroup (Phinney, 1990). Ethnocentrism is not related in a straightforward way to outgroup derogation, stereotyping or any negative cognition or emotion in particular (Brewer, 1999; Devine, 1989).

Especially in the past half century an enormous body of work has emerged on the topics of intergroup conflict, discrimination, prejudice, their consequences for each other and for group characteristics such as group cohesion, and how they influence people's perceptions of ingroup and outgroup members (for an overview see Brown & Hewstone, 2005). Work on intergroup conflict has focused on different conditions under which it takes place (Pettigrew, 1998a), the nature of the conflict, interdependence between the groups, perceived threat, and status and power differences. In this domain, the issue of how to diminish conflict, discrimination and prejudice has been of great importance. Research inspired by the contact hypothesis (Allport, 1954) has indicated that intergroup cooperation towards a shared or superordinate goal (Blanchard, Weigel & Cook, 1975) under conditions of equal status (Brewer & Kramer, 1985; Moody, 2001) is effective in achieving these goals. The development of intergroup friendships is especially effective in reducing bias (Pettigrew, 1997), but intergroup contact has been found to have positive effects on the relationship between members from different groups also in less than ideal conditions (Pettigrew & Tropp, 2006; Wright, Aron, McLaughlin-Volpe & Ropp, 1997).

Acculturation

Within this field of research of intergroup relations, from quite early on there is specific interest in the relations between different ethnic groups (Amir, 1969). However, despite the importance, relevance and richness of findings in this area, there are aspects of multicultural integration that lie outside the scope of this research tradition. Interethnic

contact implies a multiethnic or multicultural society, which in many cases is the result of recent migration. Societies are deeply affected by large scale migrations (Castles & Miller, 2009) and both the majority and minority groups undergo important changes as a consequence of their contact. These processes of change have been termed “acculturation” and are defined by Redfield, Linton and Berkovits (1936) as:

[T]hose phenomena which result when groups of individuals having different cultures come into continuous first-hand contact, with subsequent changes in the original cultural patterns of either or both groups. Under this definition, acculturation is to be distinguished from culture change, of which it is but one aspect, and assimilation, which is at times a phase of acculturation (p. 149).

Migrating and settling down in a new environment impacts virtually all aspects of life of minority groups. Starting a new life in a culturally different country often involves losing important social networks and building up new ones, having to learn a new language, changes in economic and social status, and difficulties in practicing and expressing one’s culture. Not surprisingly, emphasis in this research area has been on minority acculturation rather than majority acculturation (Dinh & Bond, 2008; Rudmin, 2003). A major aspect of acculturation for immigrants involves adaptation to the changes in environment and the challenges that this poses (Berry, 1997). Psychological adaptation, which involves perception of the self, identity and psychological well-being, can be distinguished conceptually from socio-cultural adaptation, which is related to developing social and communicative skills and culture learning (Cohon, 1981; Hurh & Kim, 1984; Searle & Ward, 1990; Ward & Kennedy, 1993a). These two concepts are, however, theoretically and empirically related.

Culture shock (Oberg, 1960), an umbrella term that captures a set of psychological aspects of intercultural contact plays an important role in psychological adaptation (Furnham & Bochner, 1986; Ward, Bochner & Furnham, 2001). In the context of acculturation, one of

the most important aspects is the stress that minorities experience as a consequence of their transition, which has also been termed “acculturative stress” (Berry, 1970, 2006; Berry & Annis, 1974). On a conceptual level, acculturative stress has often been connected to (negative) psychological health (Berry, Kim, Minde & Mok, 1987; Hovey & King, 1996; Williams & Berry, 1998), but when placed in the context of the larger body of research on stress and coping (Lazarus & Folkman, 1984) it also has ties to culture learning and the development of new social skills (Ward & Kennedy, 1996), which constitute important dimensions of socio-cultural adaptation (Searle & Ward, 1990).

It has been acknowledged that people’s general motivations to adapt and acculturate depend in part on whether the reasons behind the cultural contact are voluntary or involuntary (Berry & Kim, 1988; Richmond, 1993). In accordance, there has been special interest in the acculturation of specific groups such as sojourners (Church, 1982; Ward & Kennedy, 1999; Weissman & Furnham, 1987), refugees and asylum seekers (Briman, Trickett & Vinokurov, 2002; Donà & Berry, 1994), voluntary immigrants (Horenczyk, 1997; Sayegh & Lasry, 1993), youth, second, and third generation immigrants (Berry, Phinney, Sam & Vedder, 2006; Knight & Kagan, 1977; Portes & Zhou, 1993), native people (Berry, 1970; Berry et al., 1986; Kvernmo & Heyerdahl, 2003), and of course majority groups (Breugelmans & van de Vijver, 2004; Montreuil & Bourhis, 2001; van Oudenhoven, Prins & Buunk, 1998; Zick, Wagner, van Dick & Petzel, 2001).

In addition to context, attention has been devoted to how personality characteristics such as the big five and locus of control are related to acculturation (Armes & Ward, 1989; Ryder, Alden, & Paulhus, 2000; Ward & Kennedy, 1992). It turned out that successful adaptation cannot always be well predicted by specific traits. Given the fact that personality is to some extent dependent on culture (Hofstede & McCrae, 2004; Triandis, 2001; Triandis & Suh, 2002), it should not be surprising that rather than the personality traits themselves, the

“cultural fit” between those traits and the norms of the other culture is predictive of adaptation (Searle & Ward, 1990; Ward & Chang, 1997). A concept related to cultural fit, but without the connection to personality, is cultural distance, which refers to differences between groups on cultural dimensions, with smaller differences being related to better adaptation (Babiker, Cox & Miller, 1980; Furnham & Bochner, 1982; Ward, 1996; Ward & Kennedy, 1993b).

Berry's model of acculturation

The research reviewed so far makes it clear that multicultural integration is enormously complex; it is contingent on the interaction of personal, group-level and situational characteristics of (at least) two groups. One fact that has not been sufficiently acknowledged so far is that people are not passive subjects in these phenomena, but conscious actors; active agents (Bandura, 1989, 2006) who try to make sense of their lives and try to make the best of their lives. The way people acculturate does not just reflect passive responses to a myriad of influences, but in large part depends on people's wishes, conscious decisions and efforts. More specifically, it has been propounded that minorities have to decide on two central issues. The first of these pertains to cultural maintenance, which involves one's heritage culture and identity. The second issue relates to contact with other cultural groups and their culture. When the issues of cultural maintenance and contact are combined, four distinct acculturation strategies can be defined (Berry, 1974, 1980, 1990):

- an assimilation strategy, when individuals do not wish to maintain their cultural identity and traditions, but prefer to engage in contact with and adopt another culture;
- a separation strategy, when individuals prefer to hold on to their original culture and want to avoid contact with the other group;

- integration, when a person is interested in both maintaining the original culture and in seeking interaction with the other culture;
- marginalization, when, in contrast, there is neither interest in cultural maintenance nor in cross-cultural interaction.

Berry initially conceived of these strategies in the context of minority acculturation, but later duplicated the framework for the majority. However, majority acculturation strategies were defined as a preference for how *minority* acculturation would take place (see for instance Berry, Poortinga, Segall & Dasen, 2002).

A major strength of Berry's approach is parsimony; the acculturation strategies are based on attitudes toward two major issues that guide people during the process of acculturation. The strategies of course do not in any way replace the models and theories discussed earlier; they rather are a culmination of the phenomena they deal with. In that sense, Berry's model provides a connection between many of the interpersonal psychological processes discussed and the individual-level behavior that lies at the basis of multicultural integration.

How to take into account the interactive nature of acculturation?

Notwithstanding that multicultural integration is a process based on interactions between individuals, aggregate group and societal levels of analysis do exist. When we think about segregation and clustering, we look at groups of people; when we analyze any sort of statistics, be it on unemployment, crime, education or socio-economic status, we focus on groups. To really understand multicultural integration then, we need a model that can explain group-level phenomena, such as clustering vs. dispersion, on the basis of people's individual behaviors. This is not an easy task, and only few attempts have been made to achieve this so far. The main difficulty is that aggregate-level outcomes depend on the continuous interaction

between individuals. Traditional theories and models in the social sciences are not able to accommodate dynamical, ongoing social processes and generally look to isolate a cause and investigate its effect on certain other variables in a given moment.

Scholars are of course aware that acculturation is an interactive process. Berry (1997) explains for instance that the course of acculturation for minorities depends in large part on the acculturation strategy of the majority. It is also widely recognized that governmental policies have an important influence on acculturation (Berry, 1984; Bourhis, Moïse, Perreault & Senécal, 1997; Kymlicka, 2003). In addition, acculturation strategies are changeable over time and are influenced by interpersonal interactions--for example, when people experience prejudice and discrimination. To account for the interplay between minority and majority acculturation strategies, Bourhis and colleagues proposed an interactive model of acculturation based on Berry's model, which predicts different relational outcomes: consensual, problematic and conflictual (Bourhis, et al., 1997). Their predictions are based on expected consequences of combinations of acculturation strategies of the majority and minority groups and were generally confirmed by empirical studies (Jasinskaja-Lahti, Liebkind, Horenczyk & Schmitz, 2003; Zagefka & Brown, 2002).

These attempts to account for the interactive nature of acculturation have shown that Berry's model lends itself to making inferences about interactions and their consequences in a multicultural society. However, despite what the name suggests, the approach just described is not truly interactive. Though it does acknowledge the interactive nature of the phenomenon and attempts to provide insight in what the outcomes of interaction could be, the unit of analysis is the group and interpersonal interactions are not given a place in this approach. But acculturating groups are not homogeneous, and differences in acculturation strategies underlie different behaviors, which might influence the course of how the groups acculturate.

It is clear that it is difficult to capture the individual and group level theoretically at the same time in a holistic way, but it is important that we attempt to do so (Schönpflug, 1997).

The reason that we need to take the dynamical aspect into account is that (social) systems, which are composed of interacting agents, possess the quality of self-organization¹. Self-organization means that although agents interact and influence each other on the basis of rules that only govern individual behavior, patterns emerge out of their collective interaction that constitute important properties at the aggregate level (Barton, 1994; Kelso, 1995; Vallacher & Nowak, 1997). An example from biology may help to clarify this further. Researchers showed that a slime mold – an entity made up from a collection of cells but without a nervous system – was capable of displaying intelligent behavior when they demonstrated that it was able to solve a maze (Nakagaki, Kobayashi, Nishiura & Ueda, 2004; Nakagaki, Yamada & Toth, 2000). In search of food placed at the other end of a maze, individual cells of the slime mold move in random directions, or follow scent trails left by other cells. By chance some cells will reach the food and return to the mold satisfied. Satisfied cells leave a stronger scent than hungry cells, increasing the likelihood that other cells will follow their path and also find the food. Once a route to the food is established, more cells will reach it and in time the entire slime mold will move in its direction and so solve the labyrinth. Note that the individual cells do not possess intelligence, but that out of their interactions over time collective intelligent behavior emerges that cannot be reduced to the single cells.

Emergent properties are often surprising and non-intuitive because they cannot be well predicted on the basis of knowledge of the individual elements and their local interactions. As a result, dynamical systems are notoriously difficult to analyze and understand (Lorentz, 1963; Schuster & Just, 2005; Waldrop, 1992). But the fact that

¹ Non-linearity –the situation in which one variable cannot be described by a linear function of other variables, is a prerequisite for self-organization, which in most complex social processes seems to be the case.

interactions that are subject to very simple rules can lead to phenomena of amazing complexity is only one side of the story. If simple rules can produce complex phenomena, then complex phenomena can be explained by simple rules (Nowak, 2004). This means that, in principle, it is possible to create simple theories that explain complex phenomena, if these theories are dynamical; an approach that Nowak (2004) termed dynamical minimalism.

Deriving a simple theory about human interaction is one thing; investigating large-scale ongoing interactions between people is another. There are obvious practical limitations to this kind of research, which make it difficult if not impossible to carry out in practice. Computer simulations have provided means to overcome some of these limitations, however, and are widely regarded as the method of choice for doing research on complex dynamical systems (Bar-Yam, 1997; Nowak, Szamrej & Latané, 1990). Simulations make it possible to build simple, precise models and analyze ongoing interactions between agents in a fraction of the time it would take in reality. They also make it possible to systematically investigate the relationships between variables by manipulating their values and operations. The results of simulation studies need of course to be empirically verified to attain plausibility and practical significance.

Even though the dynamical approach is not (yet) part of the mainstream in psychology, it already has an outstanding track record in the social sciences. Important examples of the dynamical approach and computer simulations in the social sciences include work on investor decision making (Benardzi & Thaler; 1995), organizational choice (Cohen, March & Olsen; 1972), the evolution of cooperative behavior (Axelrod, 1984, 1997; Axelrod & Hamilton, 1981), opinion dynamics (Nowak et al., 1990), artificial societies (Epstein & Axtell, 1996) and Schelling's (1971) dynamic model of racial segregation that will be reviewed in more detail next.

Schelling's and Mimkes' dynamical models of social integration

Some attempts at developing simple dynamical models that directly or indirectly explain important aspects of multicultural integration have already been undertaken. The most well-known of these is Schelling's dynamic model of segregation (1971). With a series of computer simulations, he showed that simple individual rules regarding preferences of the racial make-up of one's direct environment can lead to surprising group-level outcomes. For instance, if individuals have a preference for mixed neighborhoods, but do not want to be in the minority, and are willing to move to bring their living situation in accordance with their preferences, then with high likelihood neighborhoods will become racially segregated. Although no individual actually has the goal of living in a racially homogeneous environment, it is the collective outcome on the basis of individual decisions.

Schelling developed his model to explain racial segregation in the United States, but along similar lines the results could be adopted to more generally explain segregation of people from different cultures. A limitation of this model—that it deals primarily with spatial segregation—could easily be overcome by assuming that the same rules would apply in social space. A more fundamental issue, however, is that the model lacks a solid theoretical foundation. The model certainly has face value, but its assumptions and rules were not linked to any established psychological theory. As a consequence, it is difficult to judge how well the conclusions based on this model apply to empirical reality.

Similar limitations apply to a dynamical model of multicultural integration based on the physical rules of thermo-dynamics, developed by Mimkes (1995, 2000). Mimkes' model of stochastic multi-agent interactions deals with the processes of integration and segregation between different groups. The core of the model is based on the Lagrange function, a function used in thermo-dynamics to describe the behaviour of atoms in binary alloys. The premise of the model is that a society will always evolve towards a state of maximum

common happiness, and that it will only be stable when it reaches this state. The Lagrange function is adapted from its original formulation to a form in which it is applicable to social processes. The most important variables in this new function are an emotional factor, ε , tolerance, T , and a constraint, C , which can all determine the resultant state of the system. The emotional factor, ε , is of special interest, because its elements very much resemble the underlying dimensions of the acculturation strategies in Berry's model. The emotional factor is conceptualized and formalized as follows: $\varepsilon = (E_{ab} + E_{ba}) - (E_{aa} + E_{bb})$, where E_{ab} is the emotion of group A towards group B, E_{ba} the emotion of group B towards group A and E_{aa} and E_{bb} the emotions towards the own group. The value of ε thus depends on the strengths of the four emotions. The resulting state – the extent of integration or segregation of the system after dynamical interaction between the elements – is dependent on the value of ε : positive values of ε lead to integration, negative values to segregation. A value of zero for ε would lead to a lack of interactions between individuals, and thus an absence of social dynamics. T (tolerance) can attenuate the influence of ε and with very high values even neutralize ε 's influence. The constraint, C , is an external force influencing the interaction between individuals. An example of this is the former apartheid policy in South-Africa: interaction between people was constrained by external force.

Mimkes (1995, 2000) outlines striking similarities between alloys of metals at the molecular level (solubility of molecules) and multicultural societies (patterns of intermarriage between people from different races or religions). Despite the parallels, the precision of the model, and its elegant simplicity, there is a fundamental problem with the rules that govern the behavior of the elements. We know that people behave in a different fashion than do molecules, and close inspection of the principles defining the behavior of the elements in this model reveals several shortcomings. First of all, the emotional components, which are central to the model, are assumed to be equal for all individuals belonging to the same group. As a

result, the model is in fact testing the outcomes of group-level properties in a way comparable to the dynamical model of acculturation discussed earlier. A second shortcoming is that the critical variable ε is dependent on a summation of the in- and outgroup emotions of both parties, which allows very strong emotions of one group to neutralize weaker emotions of the other. Under these conditions, the outlook of the entire society would be determined solely by the group with the strongest emotions, denying the fact that societies are shaped by mutual influence. It is questionable as well whether human action is only governed by the strongest emotion – expressed in the model by the calculation of the difference between ingroup and outgroup emotions. Another point of doubt concerns the fact that identical values of ε can be achieved by very different combinations of emotions. The model would predict identical social outcomes for identical values of ε , but in reality different emotions are linked to different behaviours, which should be reflected in the societal state. Outgroup hate by a small minority should have a different social impact than outgroup hate by the large majority for instance, but they are interchangeable in this model. Even though the outcomes of this model may be comparable to societal situations, the rules and dynamics that produce these outcomes do not compare to real social dynamics and are therefore unlikely to provide the understanding that we seek.

A dynamical model of multicultural integration

Despite detailed knowledge of many of the psychological aspects of acculturation we are still largely at a loss how to capture the dynamical aspects of multicultural integration. Existing models and theories have focused on relationships between quantifiable variables, but not much on relationships between individuals and how these evolve and shape relations between groups. In order to understand how patterns of interpersonal and intergroup contact change with time we need a dynamical model that combines the simplicity and precision of

Mimkes' and Schellings models, but which at the same time is based on empirically supported social (psychological) theory.

In this dissertation, I develop a theoretical model that is based on Berry's model of acculturation but is dynamical in nature. The model will be formalized in precise rules and will be implemented in several series of computer simulations. This model will go beyond Berry's model in several important ways:

- it is dynamical; because of this it will be able to shed light on emergent societal properties that result from individual interactions;
- the model allows for the investigation of the role of individual differences in multicultural integration; groups need not be treated as homogeneous entities;
- the model makes it possible to look at how processes of integration develop over time, providing insight into the social mechanisms that take place and possibly identifying and uncovering stages of social evolution.

The outcomes of the computer simulations will be analyzed and discussed in light of multicultural integration. More specifically, a number of claims based on Berry's model will be tested using simulation results. In addition, through means of simulation, several distinct scenarios of multicultural integration will be analyzed, and their relevance for real life situations discussed. It will also be shown how the outcomes of simulations help to formulate new claims that can be tested empirically and help in developing new theory. Finally, several of the assumptions of this dynamical model and some of the simulation outcomes will be empirically tested and discussed.

The remainder of this dissertation is organized such that the model is becoming progressively more realistic and complex. In the next, second chapter, a dynamical model of multicultural integration is developed and explained in detail. This model is kept as simple as possible. In chapter three, a series of computer simulations is presented, based on the

dynamical model, with the goal to test the logical consistency of this model, and to clarify some issues of interpretation that remained unclear during the model's development. In the fourth chapter, most of the basic assumptions of the model are tested empirically. The assumptions of the model are largely supported, even on those points where the interpretation differs from existing theory.

Now that many of the premises of the model are supported, the simulations will be used to analyze patterns and evolution of multicultural integration. In chapter five two series of simulations are presented. In the first series integration is analyzed at the group-level, as has often been the case in previous research. A limited number of distinct patterns, or scenarios, of multicultural integration are identified and discussed. In the second series of simulations individual differences are added to the model; slightly increasing its complexity, and making it more realistic.

So far the simulations were used to identify how combinations of different groups and individuals were related to specific patterns of social relations, but the simulated agents themselves did not change during the simulations. To make the model more realistic, additional complexity is added in chapter six by introducing a mechanism by which the simulated individuals react to their social environment; their attitudes change over time as a function of social interactions. The results of these simulations display true emergent properties, which are unintuitive and surprising. At this point the dynamical model is not expanded further, but attention is turned to how such simulation studies and empirical studies can complement each other better.

In chapter seven, in order to bring the findings of the simulations closer to reality, large scale survey data is used to compare some simulation outcomes to. This dataset includes both psychological and structural measures, fitting the comprehensive dynamical

approach. This analysis is also used to explore some possible future directions for acculturation research. General conclusions are presented in chapter eight.

Chapter 2

A dynamical model of multicultural integration

The art of constructing dynamical models and theories is “leaving out” rather than “adding on”. A model should include the smallest number of variables and simplest principles capable of producing the phenomenon of interest; this ensures the development of elegant, parsimonious theory (Nowak, 2004). Berry’s acculturation strategies seem an ideal candidate to serve as the central variable in this dynamical model for a number of reasons. First of all, they are simple, which satisfies the important prerequisite for dynamical models. The acculturation strategies consist of the combination of only two attitudinal dimensions: preference for home-culture maintenance and preference for contact with the other culture.

Second, they specifically aim at explaining the phenomenon of interest. Acculturation may be broader than multicultural integration because it also includes processes of psychological and socio-cultural adaptation for instance, but social contacts are a core component of acculturation. Culture maintenance and contact with another culture necessarily involve contact with bearers of those cultures. Moreover, the definition of acculturation explicitly specifies that it results from ongoing, first-hand contact between the groups. There are other theories that could be considered, such as intergroup contact theory, but they are not as explicitly related to acculturation. In addition, acculturation strategies comprise both attitudinal and behavioral components (e.g. Berry et al., 2002), matching the nature of the dynamical model, in which the mental underlies social behavior.

Third, the existence and functioning of acculturation strategies have been empirically verified, providing a theoretical basis for the dynamical model. Valid measurement tools have been developed (e.g. Berry et al., 2002; Ryder et al, 2000) and acculturation strategies have

been shown to have predictive validity in several domains, such as stress (Berry et al., 1987; Krishnan & Berry, 1992), mental health (Berry & Kim, 1988; Rogler, Cortes & Malgady, 1991; Schmitz, 1992), self-esteem (Phinney, Chavira & Williamson, 1992), psychological and socio-cultural adaptation (Ait Ouarasse & van de Vijver, 2005; Kosic, 2002; Ward & Kennedy, 1994), ingroup bias (Piontkowski, Florack, Hoelker & Obdržálek, 2000), perceived threat (Piontkowski, Rohmann, & Florack, 2002; Rohmann, Florack, & Piontkowski, 2006) affect towards the outgroup (Zagefka, Brown, & Gonzalez, 2008), identity (Nesdale, 2002; Phinney, Berry, Vedder & Liebkind, 2006), and intergroup relations (Zagefka & Brown, 2002).

Fourth, because of the many links to other variables and research, the acculturation strategies ensure that the dynamical model is well connected to other fields of research and that its results can be interpreted in light of various other perspectives. Complementary theories on, for instance, prejudice, discrimination and ethnocentrism could be partly adopted into the model to investigate how they relate to processes of multicultural integration.

Defining the dynamical model of multicultural integration

Because the dynamical model of multicultural integration will be implemented in a series of computer simulations, all its variables, their relations and the rules of interaction between people have to be precisely defined so that they can be formalized. The first step is to translate the acculturation strategies into computational form and determine how they relate to individual behavior, in order to determine how it will affect interpersonal interaction and the establishment of social ties.

The acculturation strategies are defined by the combination of the dimensions of cultural maintenance and contact with the other culture, and the question is whether to adopt the strategies themselves into the model, or the dimensions they are based on. The issue

whether focus should be on the strategies or their underlying dimensions has already received considerable attention in the literature and the debate is yet not settled (Berry, 2003, 2009; Nguyen & von Eye, 2002; Rudmin, 2003; Ward & Rana-Deuba, 1999).

The main reasons for focusing on strategies is the claim that there are certain qualitative aspects to them that set them apart from each other and that cannot be captured by looking at their underlying dimensions separately (Berry, 2003). If acculturation strategies are preferred as the unit of analysis, they need to be assessed individually, turning them into a kind of categorical variable. However, endorsements of different strategies are not mutually exclusive, and people may show preference for several acculturation strategies simultaneously. If one strategy has the strongest support, people could be regarded to hold that strategy rather than others, but this does not need to be the case. Even if it is conceivable to relate each strategy to specific behaviors, which is important in the context of a dynamical model, it would be difficult to imagine how support for multiple strategies translates into behavioral counterparts, which is a problem. In addition, the way of measuring the separate strategies has received serious critiques on psychometric grounds, relating to item construction and internal validity (Rudmin & Ahmadzadeh, 2001; Rudmin, 2003, 2009).

It seems preferable then to adopt the two acculturation dimensions of culture maintenance and contact with the other culture. Valid measurement tools have been developed to assess them (e.g. Ryder et al., 2000), providing scores on a continuous scale. It remains to be determined how each dimension relates to behavior. The two dimensions are orthogonal (Berry, 1997; Ryder et al., 2000) and so the relationship to behavior can be determined individually for each dimension; something that would not be possible for acculturation strategies.

Conceptualizing and re-conceptualizing acculturation attitudes

The dynamical model of multicultural integration deals with social integration and thus we must establish how preferences for cultural maintenance and contact with the other culture are related to social interactions. For minority groups, it can be inferred from the description of the two dimensions that individual behavior can range from actively avoiding to actively seeking contact with the majority group and with the own group. This inference rests on the idea that a preference for contact with the majority culture translates into a preference for contact with members of the majority group; a preference not to adopt the majority culture is then linked to contact avoidance. A comparable pattern would hold with regard to the own group for the culture maintenance dimension.

It could of course be that both acculturation attitudes play a role when it comes to ingroup contact. Minority members who opt for assimilation to the majority culture might wish to avoid contact with minority members who strongly wish to live according to the values and traditions of their heritage culture, for instance. They might instead prefer contact with like-minded minority members who have largely adapted to the majority culture. An indication for this is the finding that minority members favoring assimilation identify less with their ethnic group than those who favor integration (Verkuyten, 2005). At this stage of model development, these issues will be left aside however, but it may very well be that at a later moment, when more is known about these issues they can enrich the model and help to provide more detailed and nuanced insights.

For the majority group, it is less straightforward how to link the dimensions of culture maintenance and contact to social behavior (de Raad, 2013). Although majority group members might have a preference for a specified acculturation strategy, this preference, as defined by theory, really only concerns the acculturation strategy of minority group members, not majority group members. Majority acculturation strategies are thus preferences regarding

minority acculturation strategies (e.g. Berry, 2003), and do not concern their own acculturation processes. This is somewhat surprising because in a sense it precludes, or at least severely limits, our understanding of majority group acculturation even though acculturation is explicitly understood as affecting *both* groups (Redfield et al., 1936).

If this approach is followed, on the contact dimension a majority member should be asked, for example, “do you prefer minority members to have/seek contact with member of your group?” instead of “do you want to have/seek contact with minority members?” There is a big difference however between wanting to have contact with others, which implies the person him/herself, and wanting others to seek contact with your group, which could imply anyone. This becomes even more apparent by looking at Bourhis’ description of Berry’s model (Bourhis et al., 1997). For the majority, the two acculturation issues are defined by questions about the “acceptance” of immigrants adopting the culture of the majority and “acceptance” of the minority maintaining their own culture. Non-acceptance would likely indicate a negative attitude. But acceptance does not necessarily imply a positive attitude: acceptance could well designate a neutral attitude, or even a negative one. This conceptualization of majority acculturation strategies seems to have been adopted by most researchers to date (see for instance Arends-Tóth & van de Vijver, 2003; Geschke, Mummendey, Kessler & Funke, 2010; Zagefka & Brown, 2002; Zagefka, Tip, Gonzalez, Brown & Cinnirella, 2012).

The way in which the majority’s preference on the contact dimension is conceptualized is very passive in comparison to the minority, who are supposed to take initiative and be actively involved in the process of acculturation. It is particularly unclear how positive attitudes for majority members relate to social behavior on the contact dimension. Majority group preferences seem to be less personally relevant and appear to be

distributed over a more limited range than those of the minority group, which clearly range from active avoidance to active seeking (de Raad, 2013).

For the majority culture maintenance dimension, the most obvious interpretation in line with Berry's definitions (and the one which is used in research) would be to see it as the majority's preference for minority members to either hold onto or let go of their heritage culture. But again this is a passive definition based on a preference for minority member behavior. To make it more active, this dimension could be reinterpreted as liking or disliking of the minority culture: liking would motivate a person to get in contact with the culture, disliking to avoiding contact with the culture. From this it follows logically that a majority member might prefer not to be in contact with minority members, but might have a positive attitude towards their culture. This could take the form of a preference for music, food, or certain customs of the minority culture, or even going on vacation to their country of origin.

It seems questionable though whether attitudes towards minority culture and contact with minority members are independent from each other, as seems to be assumed in Berry's model. Rather, a preference regarding minority culture maintenance may be related to a preference for contact with minorities. If a person has a strong preference for minorities to adopt the majority culture, it could mean that this person would be unwilling, or less willing, to engage in contact with minority members who wish to maintain their culture.

The little existing research that produced findings relevant to this question is inconclusive. In one study, it was found that a preference for integration (preference for minorities to seek contact with the majority while maintaining their own culture) is related to more positive behaviors and less prejudice towards the minority than is a preference for assimilation or separation, strategies characterized by a wish for minorities not to maintain their culture (Zick et al., 2001). However, in a longitudinal study, the contact acculturation

dimension was found to influence intergroup affect, while the culture maintenance dimension did not (Zagefka et al., 2008).

A comparison of the majority and minority preferences regarding culture maintenance makes it clear that in general majority and minority acculturation have been conceptualized differently in Berry's model (de Raad, 2013). Whereas the culture dimension for the minority members refers to their own culture, the culture dimension for the majority group does not refer to their own culture. In this way, the majority culture is excluded from being evaluated by majority members during acculturation. Even though the definition of acculturation states that cultural patterns of both groups change, Berry's model does not include any possibility of the majority to reflect on their own culture in the way that the minority is supposed to. Yet one of the greatest values of a multicultural society for the majority culture is the very fact that through its diversity it encourages people to reflect on their cultural values, norms, practices, institutions, etc. (e.g. Parekh, 2000).

It thus seems that Berry's model is primarily suited to capture minority acculturation. The duplicate framework for the majority is rather imprecise, leaving it unclear how majority acculturation strategies are linked to meaningful behavioral counterparts, making comparison with minority acculturation difficult. These might be reasons that Berry's model has been less often used as a tool to study majority acculturation and that majority acculturation is less documented than minority acculturation.

Despite the imbalance resulting from the way majority and minority acculturation strategies are formulated, Berry's model in general does seem to fit modern Westernized societies with an influx of immigrants, and countries with indigenous groups whose lifestyles differ from the majority, such as many European countries, Canada, the USA or Australia. But anecdotal evidence can be presented showing that the acculturation context might be different. In these cases, it does not seem to be a question of the minority coming into contact

with the majority, but rather the other way around. There are numerous instances where the minority group has access to most of the resources, and a large minority group is living in (relative) poverty, as is the case in several developing countries in South America, Africa and Asia, or in the traditional context of colonialism. The minority has often adopted a modern Westernized lifestyle, with a high standard of living, while the majority lives in a more traditional manner, with a much lower standard of living. Berry's acculturation strategies seem to be less suited for these situations. It should be noted that these observations do not invalidate Berry's model, but rather seem to limit it to certain types of societies.

It may be too ambitious to formulate or expect a model to be inclusive of all possible acculturation scenarios. Nevertheless, it is unclear how to interpret Berry's majority acculturation attitudes even in those situations where the model is evidently relevant. The fact that both majority acculturation attitudes regard the minority suggests that both issues together define the way in which a person from the majority acts and reacts towards minority members. A preference for minority members to seek contact with the majority group might indicate a personal preference for contact with minority members, although this is far from clear, as pointed out in the discussion above.

In order to proceed with the construction of the dynamical model, the relations between the acculturation attitudes and behavior need to be defined. For minorities it is assumed that the contact acculturation attitude is related to contact with the majority and that the culture maintenance attitude is related to contact with other minority members. If attitudes towards contact with the majority are positive then contact is sought with outgroup members, if attitudes are negative contact is avoided. The same pattern is assumed to be true for the culture maintenance attitude. Because it is unclear for the majority group how Berry's attitude contributes individually to social behavior, I assume that majority members have

some general attitude or orientation to minority groups, which ranges from negative to positive, and which is predictive of contact seeking and avoiding behavior.

So, the main difference between the dynamical model and Berry's model is that majority preferences regarding minority culture maintenance and contact between one's own group and the minority are substituted by one general orientation or attitude towards the minority. Questions regarding the relationship between the majority acculturation attitudes, a general orientation or attitude towards minorities, and social contact with minority members need to be clarified through empirical testing.

Formalizing the model

With these theoretical issues in mind, the dynamical model can be further laid out. In the model it is assumed, in line with Berry, that minorities have an attitude regarding engaging in contact with, and adapting to the culture of people of the majority, and that they have an attitude regarding maintaining their heritage culture. Majority members are assumed to have a general attitude or orientation towards minorities. These attitudes are assumed to be continuous: from very positive to very negative. For each actor, the attitudes determine how interactions with other individuals (either from their own or from the other group) are evaluated. It is assumed that people have a natural drive to seek contact with others and that this affects their well-being or satisfaction (Baumeister & Leary, 1995). In addition, it is assumed that social contacts are motivating because they can increase satisfaction (Maslow, 1954). An interaction with an individual toward whom one has a positive attitude increases satisfaction; contact with someone towards whom one has a negative attitude decreases satisfaction. The amount of increase or decrease in satisfaction is related to the strength of the attitude the person has towards the other. Individuals maximize their satisfaction by seeking and avoiding contacts, trying to create the optimal composition of social contacts. In this

model, individuals will behave in such a way as to increase the number of contacts that are positively valued and as to avoid contacts that are negatively valued.

The relationship between satisfaction and the number of social contacts is non-linear, however. Research within the framework of the social impact theory has shown in various domains that, as numbers of people increase, the additional impact of each additional person decreases (Latané, 1981). This means that, in line with the law of diminishing utility (Edwards, 1954; Samuelson & Nordhaus, 2005), the increase in satisfaction for each additional contact becomes smaller. In other words, the effect on satisfaction of the first contact is larger than that of the second, which in turn is larger than the effect of the third, etc. The Dynamic Theory of Social Impact (Lewenstein, Nowak & Latané, 1993; Nowak et al., 1990) specifies that the impact of a group of individuals changes as a square root of the number of individuals exerting impact; a rule that is also adopted for the dynamical model of multicultural integration.

Because people have preferences for contact with individuals from two different groups, individuals from each culture are counted separately. The relationship between the variables can be summarized with the following formula:

$$S = A_{own} * \sqrt{N_{own}} + A_{other} * \sqrt{N_{other}}$$

Explained in words, this formula expresses that satisfaction, S , depends on the square root of the number of contacts from the own group, N_{own} , and from the other group, N_{other} , added together, taking into account the attitude one has towards contacts with each of those groups, A_{own} and A_{other} respectively. The decreasing marginal utility is implemented here by taking the square root of the number of contacts for each group.

Majority satisfaction thus also depends on contact with both majority and minority members. However, because majority culture maintenance is not part of Berry's model, there is no ground on which to base rules of valuing or evaluating contact with other majority

members. It is clear of course that people from the majority do value contact with others from their group, and therefore the attitude towards their own group is fixed as maximally positive.

Implementation in a computer simulation

Dynamical models differ from “traditional” models in the way their behavior can be understood. Because they are constructed to capture the outcomes of lasting and repetitive interactions between elements, or in this case people, it is not easy or even possible to logically deduce what the potential results might be. In other words, unlike with most models and theories, it is not possible to make any precise testable predictions or hypotheses until the models properties have been analyzed. The best method to analyze the properties of dynamical models is by means of computer simulations (Bar-Yam, 1997; Nowak, Szamrej & Latané, 1990).

There are two important reasons why computer simulations are an excellent tool. First of all computer simulations allow to include time evolution in the analysis easily. Ongoing interaction is the defining property of dynamical systems, and it is thus crucial to be able to observe it closely. The second reason is that dynamical systems have emergent properties that cannot be inferred from the characteristics of the elements of which it consists. For the dynamical model this means that it is likely that interactions between individual lead to outcomes at the group or societal level that cannot be directly related to people’s attitudes or the way they interact personally.

In computer simulations it is possible and even necessary to precisely define the properties and behaviors of the interacting elements. Theoretically, a virtually unlimited number of elements and interactions can be simulated so that it becomes possible to see and measure the aggregate outcomes that result from these individual level interactions. Because both the micro and macro level are represented in the simulations it becomes possible to

understand the way in which they are connected, and thus understand how surprising emergent properties can appear.

Now that the core of the model has been defined theoretically, the next step is to represent the model in a virtual environment to allow it to be simulated in a computer program. Specifying the relationships between variables in a mathematical way is a prerequisite for this, and thus the next step is to transform the “verbal” model into a numerical one.

What matters most in multicultural integration are the social connections that exist between people. If we created a visual representation of a group of people with the existing ties between them, we would end up with a network of interconnected elements. It therefore makes sense to use a simulation model in which people are represented in a network.

Social network analysis can get quite complex (Wasserman & Faust, 1994), so a simplified network model was preferred, in the form of a cellular automaton (von Neumann, 1966). Cellular automata are two-dimensional models in which space is divided in discrete locations, or cells. Time evolves in discrete steps, and with each step cells can interact according to local rules. Cellular automata are simple models that are nevertheless capable of producing very complex dynamics and have been the model of choice for investigating dynamic phenomena that arise from local interaction of elements (Wolfram, 1986, 2002). In the social sciences it has been explicitly argued to use cellular automata to investigate dynamic social processes (Gilbert & Troitzsch, 2005; Hegselmann, 1998, Nowak & Vallacher, 2002).

Social interactions were simulated using a square lattice of cells (like a very large checker board) in a two dimensional space. This layout should be primarily interpreted as representing social space, not physical space. Individuals, or agents, were assigned to a

group, and given attitudes towards their own and other group ranging from -1 to +1. Next they were located in a random cell on the board. Cells could only be occupied by one agent and some cells would remain vacant to allow for freedom of movement of the agents. During the simulation agents would be randomly selected and asked to evaluate their current happiness based on their immediate neighbors, according to the formula specified above. Immediate neighbors are agents that are located in any of eight surrounding cells (to ensure that all locations had an equal amount of neighboring cells, the board was turned into a torus, which visually resembles a donut shape). Happiness was dependent on the number of contacts, not on the number of cells; if some of the surrounding cells were empty, happiness was based on less than eight contacts.

Next, agents would be offered random vacant locations to move to if they so desired. A decision to move would be made if a spot would provide a higher level of happiness than the current location. However a 'cost' of moving was included by setting a rule that agents would only move if they could obtain at least a ten percent increase in happiness. This is to stabilize the model a little by preventing agents moving for very small increases in happiness. The rationale is that a decision to take action — move — would only be undertaken if this led to a substantially higher satisfaction. The simulation would end if no agent moved any longer or after an arbitrary set limit.

Clarification and discussion of implicit assumptions

The model rests upon several implicit assumptions that need to be discussed and clarified. In the model members of the own group and the other group are counted separately, which is in accordance with many psychological theories dealing with ingroups and outgroups, which have the explicit assumption that people treat ingroup and outgroup members separately. Because of the principle of decreasing marginal utility in this model –

the fact that interaction with each additional person changes one's satisfaction to a lesser degree compared to each previous person, the specific manner in which satisfaction is calculated has some important consequences. Because ingroup and outgroup members are counted separately, the principle of the decreasing utility operates on those groups independently. This means that a person's behavior can be disproportionately influenced by a single individual. For example, let us assume that a person has a maximally positive attitude towards the own group (+1), and a moderately positive attitude towards the outgroup (+0.50). If this person initially had 8 ingroup contacts, satisfaction would be simply $1 * \sqrt{8} = 2.83$. However, this person would "give up" 2 ingroup contacts for a single outgroup contact because $1 * \sqrt{6} + 0.5 * \sqrt{1} = 2.95$. As a result of the decreasing marginal utility operating independently on ingroup and outgroup, the impact on satisfaction for a person's first outgroup contact is larger than the impact on satisfaction of contacts 7 or 8 of the ingroup, even though one's attitude towards the ingroup is twice as positive than towards the outgroup. Thus in this model people with positive outgroup attitudes actively look for outgroup contacts and are likely to give up ingroup contacts for outgroup contacts.

It does not seem plausible that in reality, under normal circumstances, one would give up part of one's social contacts to be able to engage in contacts with members of another group. Because the total number of a person's contacts is limited in this model, the situation is zero-sum: more contacts with one group leads to fewer contacts with the other. On the other hand, the total number of contacts in real life is also limited (for estimates see Dunbar, 1993; Hill & Dunbar, 2003; McCarty, Killworth, Bernard, Johnsen & Shelley, 2001), although of course much larger than the eight contacts in this model. The way this mechanism should be interpreted in the context of this model then is not in real numbers, but in the ratio that results between contacts with members of both groups.

Related to this point is that group membership is presumed to be clear and fixed. One could ask if such a strict ingroup-outgroup dichotomy is realistic. Perhaps it is more like a continuum where in-groups and out-groups can differ from being identical – value zero; out-group and in-group are perceived as a single category) till some value that indicates complete (perceived) differentiation. In situations where people of different groups have been living together for a very long time, it might happen that group membership no longer is a defining characteristic in social interactions. In this case, it does not matter to people whether they interact with a person from their own or other group, because they do not see people in terms of group membership. In this case, satisfaction should be calculated on the basis of a single group. This situation therefore would seem to fall outside of the domain of this model. It is likely that in such a situation acculturation no longer plays such an important role; both groups have adapted and reached a stable social state in which group membership is no longer an issue. This is not to say that this state is unchangeable; there are many examples where group divisions did not play a role for a long time, to lie at the basis of change or conflict later on, as in former Yugoslavia for instance.

With regards to the relationship between attitude strength and satisfaction, a more negative attitude in the model designates a weaker preference towards contact, which translates into absolute lower satisfaction from contact with people. In specific cases this can conflict with the assumption that human social contact is a basic human need. If a person had an attitude of precisely zero both towards the ingroup and outgroup, then this person would not look for contact with any person, which would result in a satisfaction of zero, without any motivation to get in contact with others. A person can maintain contacts with others without gaining any satisfaction from those social contacts; satisfaction will always be zero. Total apathy towards others may exist in real life in some cases. For example, while in shopping malls people may be indifferent towards others of either their own or the other group.

However, as people are not usually totally apathic and indifferent towards social contact, it is assumed that people's attitudes towards their own and other groups will not be *exactly* zero, or at least not at the same time. In cases where people have negative attitudes towards any group this will result in general avoidance of contact and so people will prefer to have no social contacts. This seems to be pathological, and indeed a strategy defined by negative attitudes towards both the ingroup and the outgroup – marginalization in Berry's terms – is linked to psychopathology (Berry, 1997; Schmitz, 1994).

A final thing to note is that every time an agent moves during a simulation the social connections with the previous contacts are broken. Social contacts are not individuated in the simulations, so contact with one group member is interchangeable with contact with another. Therefore breaking contacts does not really have meaning in this context. What is of interest is the make-up of contacts according to group membership, which can be perfectly investigated under these circumstances.

Chapter 3

Computer simulations of the Dynamical Model: First test

In simulation studies the best approach is to start with simple parameters, and slowly expand the complexity of the simulations after the effects of the initial parameters are thoroughly understood. Because this dynamical model is mainly based on Berry's model of acculturation, it makes sense to run a series of simulations that tests some predictions based on the aspects that both models have in common. In addition it would be interesting if the simulations could tell us something more about issues of dispute that were encountered during the formulation of the dynamical model. A last thing to test would be some tentative expectations on the basis of writings on acculturation and immigration in general that lie within the range of possibilities of the model.

Because Berry's model has so far often been used to characterize people according to acculturation strategy and to relate these to other variables such as intergroup contact and mental health, it makes sense to start out with relatively simple simulation scenarios in which it can be investigated if the outcomes conform to earlier findings. A good way to do this is to use homogeneous groups in terms of acculturation strategies and test how combinations of all possible strategies influence simulation outcomes. After these effects are understood, the simulations can be made more complex by introducing individual differences within the groups, for example.

Acculturation strategies are conceptualized such that the contact dimension refers explicitly to contact with the other group. As a consequence, it can be assumed that this dimension is the most important in light of contact between the groups. For both the majority and the minority it is therefore expected that the preference for contact with the other group is

more strongly related to integration than is the preference for contact with the own group. By the same token, it is predicted that the attitude towards the own group will be more strongly related to group clustering (as opposed to integration) than will be the attitude towards the other group.

Research on minorities concerning the relation between acculturation strategies and stress and mental health has indicated that the integration strategy is linked to the most positive outcomes, marginalization to the worst, and separation and assimilation falling somewhere in between (Berry, 1997; Berry, Phinney, Sam, & Vedder, 2006). The dynamical model does not include measures of stress, but it measures satisfaction based on the match between a person's social contacts and attitudes, which logically should be related to psychological well-being. It is therefore expected that a pattern of relations between satisfaction and acculturation strategies will be found that matches the one between mental health and acculturation strategies found in empirical studies.

During the formulation of the dynamical model, a topic of debate concerned the role of the two dimensions that together define acculturation strategies. Berry prefers to focus on acculturation strategies because of the unique qualitative aspects that they possess (Berry, 2003), although other authors prefer to focus on the two underlying dimensions (Nguyen & von Eye, 2002; Ryder et al., 2000; Ward & Rana-Deuba, 1999). Following Berry's approach, one would expect distinct outcomes related to the acculturation strategies. Because acculturation strategies are defined by positive or negative attitudes toward the issues of cultural maintenance and contact with the other culture, it's expected that the sign of an attitude should be more important than its strength. In other words it should not matter much if the value of an attitude is 0.25 or 1, because as long as it is positive it belongs to the same acculturation strategy. However, a negative value on this dimension, even if small, should then be related to noticeably different outcomes because it would mean we are dealing with a

different acculturation strategy. In its most extreme form this would mean that all positive and all negative values of an attitude should lead to the same results (in combination with fixed values on the other dimension), but that the differences in outcome between positive and negative attitudes should be rather dramatic. Therefore, according to Berry's conceptualization, one would predict a rather dichotomous pattern of multicultural integration related to the two dimensions, with a sudden jump when attitude values go from positive to negative. Alternatively a smoother, more continuous pattern is expected on the basis of the dimensional approach.

The previous predictions regarded the dimensions individually, but by the same token, on the basis of Berry's approach uniform outcomes would be expected for all value combinations of the two dimensions as long as they define the same strategy. Simulation results should thus show comparable patterns of social integration for all combinations of attitudes that fall within a single acculturation strategy. If there is wide differentiation in social integration within acculturation strategies this would indicate support for the approach that focuses on the dimensions.

A last topic of interest in this simulation study is the role of neutral attitudes. The strategy approach leaves no space for neutral preferences, as neutral values designate the borders between acculturation strategies. Neutral attitudes belong to either two acculturation strategies, or to none; either way they seem not be regarded of being of importance as they have been completely ignored. In reality people are often undecided or ambivalent though and it seems questionable to presume that should be different with regard to cultural maintenance or contact with the majority. Because of the continuous nature of the attitudinal dimensions it is possible within this approach that people are neutral towards an issue. A neutral attitude would fall on the border between two acculturation strategies, and so it is

predicted that the level of social integration lies halfway between those of the two bordering strategies.

Hypotheses

In order to provide a clear overview of the expected outcomes of the simulations, all hypotheses are summed up below:

1. Social integration is caused primarily by attitudes towards the other group.
2. Group clustering is caused primarily by attitudes towards the own group.
3. The integration strategy is predicted to be related to the highest levels of satisfaction, marginalization to the lowest, and the separation and assimilation to levels of satisfaction in between the other two.
4. The effects of the two dimensions are related to social integration in a severely non-linear manner.
5. For each acculturation strategy, combinations of different strengths of attitudes that lie within the borders of that strategy are related to comparable levels of social integration.
6. The degree of social integration related to neutral attitudes falls between the levels of social integration related to the bordering acculturation strategies of those attitudes.

Methods

The simulations were conducted on a square grid consisting of 50 rows and columns, resulting in a total number of 2500 cells. This size was large enough for the phenomena of interest to unfold without being affected by space limitations, and simulation times were reasonable. Twenty-five percent of the 2500 cells were left open — empty, to provide ample space for agents to move. There were just two groups, the majority and minority, in the ratio 80/20. This ratio is to some extent arbitrary, but was chosen for two reasons. First, very small

minorities do not really fit the definition of acculturation in the sense that the majority group would not be greatly affected. Second, minority groups often become concentrated in urban areas. So although there are relatively few countries with minorities as large as 20 percent, in urban areas a ratio of 80/20 is realistic. At the onset of a simulation, agents were randomly assigned a location on the grid, which would typically look like Figure 1.

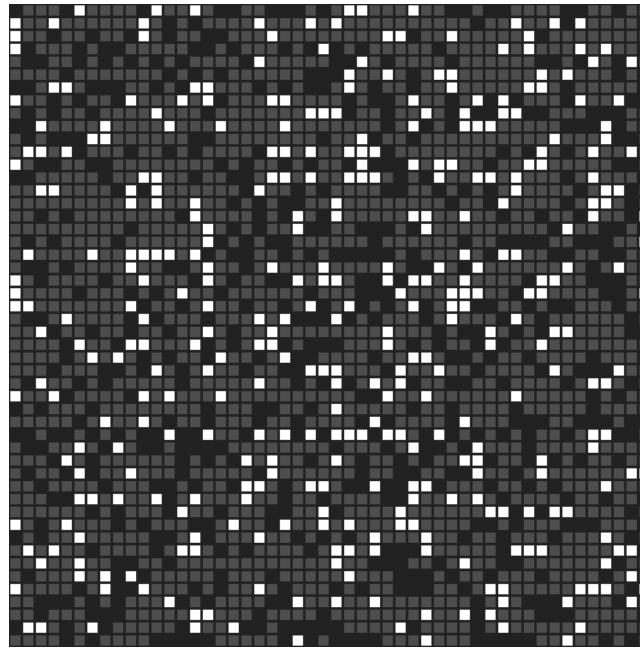


Figure 1
Initial state of a simulation in which agents of two groups — depicted in white and gray — are randomly distributed on a grid. Black color indicates empty spaces to which agents can potentially move

During the simulation, agents are randomly selected and “asked” to evaluate their current satisfaction based on contact with their immediate neighbors, according to the formula specified earlier. Immediate neighbors are agents that are located in any of eight surrounding cells (to ensure that all locations had an equal number of neighboring cells, the “board” was turned into a torus, which visually resembles a donut shape). Satisfaction was dependent on the number of contacts, not on the number of cells; if some of the surrounding cells were empty, satisfaction was based on fewer than eight contacts.

Next, agents would be randomly selected and offered up to ten random vacant locations to move to if they so desired. A decision to move would be made if a spot provided a higher level of satisfaction than the current location. However a ‘cost’ of moving was included by setting a rule that agents would only move if they could obtain at least a ten percent increase in satisfaction. This was to stabilize the model a little by preventing agents moving for very small increases in happiness. The rationale is that a decision to take action — move — would only be undertaken if this led to a substantially higher satisfaction level. Some randomness or noise was added to the model to prevent possible artificial stable social configurations based on the model’s geometry. In addition to voluntary decisions, each time an agent evaluated a potential spot to move, there was a one in ten thousand chance that the agent accepted this offer, as long as the spot resulted in a level of happiness different from zero—in order to prevent social isolation. This may seem like a very low probability, but tests with different values showed that this value generated sufficient randomness to prevent artificial stability, without leading to so much randomness that the behavior of interest became obscured.

On average, each agent had the same chance of being selected and to be offered the opportunity to move. The selection process was organized in discrete cycles; within each cycle, the number of agents selected equaled the total number of agents in the simulations. Because agents were selected randomly it could happen that in a given cycle some agents were selected multiple times, while others were not selected at all. Each simulation lasted for 2000 cycles, so in the long run each agent would be offered ample opportunities. Generally the results of a simulation are already clear after as few as 200 cycles, so this number was sufficiently large.

Design

The minority attitudes towards their own group, towards the majority group and the majority attitude towards the minority were systematically varied, taking on the following values: -0.50, -0.25, -0.10, -0.05, 0.00, 0.05, 0.10, 0.25, 0.50

The majority attitude towards the own group was fixed at 0.50, which in these simulations was the maximum positive value used.

Acculturation strategies (for the minority only) were operationalized according to Berry's classification: the integration strategy was defined by positive attitudes on both dimensions, marginalization by two negative attitudes, separation by a positive attitude towards the ingroup but a negative attitude towards the majority, and assimilation by a positive attitude towards the majority, but a negative attitude towards the ingroup. Attitude values of zero were thus not used in this classification.

Attitudes were distributed uniformly within each group; all agents of the same group were assigned identical values. In experimental terms, this would be equivalent to a 9 x 9 x 9 design with 729 conditions — one of the advantages of computer simulation. Three simulations were run for each condition, resulting in a total of 2187 simulations.

Measures

- The measure of the extent of social/multicultural integration was constructed by comparing the actual extent of contact between the groups with the extent of contact that would be expected on the basis of randomness. In a perfectly integrated multicultural society, culture should not be an issue in interpersonal contacts and thus contacts between the groups should be random when it comes to group membership. Deviations from randomness can then be used to calculate an index for integration. This index has a value

of zero in case of total segregation — no contacts between the groups, and a value of 1 for perfect integration, or a random distribution of contacts.

- The measure of group clustering was based on the ratio of ingroup contacts. If group members would socialize exclusively within the group—complete segregation, this would result in a clustering index value of 1. If group members would have no contact whatsoever the clustering index would reach zero.
- The measure of satisfaction was obtained by averaging the standardized satisfactions of all agents of the same group at the end of a simulation. From the formula for an agent's satisfaction it can be deduced that the absolute levels of satisfaction are dependent on the strength of an agent's attitude. An attitude of value 1 is capable of producing twice as much satisfaction than an attitude of value 0.5, because the attitudes are part of a multiplicative function. This is unproblematic as long as satisfaction values of the same agent are compared, but not when satisfactions of agents with different attitude strengths are compared. However, for each specific combination of attitudes there exists a maximum and minimum level of satisfaction that can be obtained. By dividing an agent's satisfaction level by the maximum obtainable satisfaction (in case of a positive value) or the minimal obtainable satisfaction (in case of a negative value) a standardized satisfaction is obtained, with a range of -1 to 1.

Results

A word of explanation is required to explain how simulation results are interpreted and evaluated. Often only visual representations of the simulations themselves or of their numerically represented outcomes are used, without using formal statistical tests. The reasons for this are twofold. First, there are qualitative aspects related to emergence that are not easily captured by statistics and could be overlooked if focus were on numbers alone – this is

inherent to emergent properties. However, while this argument encourages the inspection of visual representation of simulations, it alone would not warrant foregoing statistical analysis altogether. The second argument, and the reason that statistical testing is not appropriate, is related to the nature of the data produced by simulations. Statistical tests in one way or another rely on the comparison of treatment/non-random effects with random effects/error. In simulations the treatment effects are the result of the different starting values the researcher uses as input for the simulations, which is comparable to the manipulation of the independent variable in an experiment. The random effects in an experiment are made up of the individual differences between the participants. In a simulation however, there are no individual differences between the agents, and thus there is no—or very little—random effect or error in the data¹. Of course, one could design randomness into the model, but the point is that the size of the effect, the error and the number of observations (= number of agents or simulations) are all largely under control of the investigator. So if essentially all the elements that decide about the statistical importance of an effect are under the control of the researcher, then any arbitrary statistical outcome could be produced². It is clear that under these circumstances statistical tests lose their value and that it would be appropriate to resort to strategies of analysis that are more informative. Visual inspection of outcomes in this case is more appropriate. This includes visual inspection of graphs representing the values of the variables in the model. Although the statistical significance of an effect may be rather meaningless, the size of its effect compared to the effects of other variables tells us a lot about the relative importance of an effect. Moreover, the fact that statistical significance is not useful does not mean we can draw no conclusions about the practical significance of

¹ In this study the error term is not based on differences between agents, but on differences between simulations with the same starting conditions. Our unit of analysis is a simulation, not an agent. However the same principle applies when it comes to the sources of randomness/error.

² In this simulation study, univariate analysis of variance with social integration as dependent variable and majority and minority ingroup- and outgroup-attitudes as independent variables shows that all main effects all interactions and even all pair wise comparisons are significant at the $p = .001$ level.

effects. We can observe the size of the effect in relation to a phenomenon and draw conclusions about its relative importance.

When we turn to measures of effect size however, we encounter some difficulties again. The generally preferred measure of effect size, omega-squared ω^2 (Howell, 2002) includes an error term (MS), which in our case practically equals zero³. As a result, ω^2 will simply represent a ratio of the variance (effect) of each variable relative to the other terms in the model, e.g. other variables and their interactions. So, these omega-squared values do indicate the relative importance of a term in the model, but do not include random effects or error, as would normally be the case⁴.

In all but the last of the following results, the conditions that included neutral attitudes were omitted from analysis. Most of the first five hypotheses refer directly to and test Berry's model, in which neutral attitudes have no place, and so it seemed better not to include them in these tests. Only the sixth hypothesis refers specifically to the role of neutral attitudes.

According to the first hypothesis, outgroup attitudes have a bigger impact on social integration than do ingroup attitudes. This comparison can only be made on the basis of minority attitudes, and, as predicted, outgroup attitudes do have a stronger influence on the extent of contact between the groups than do ingroup attitudes; the effect sizes are .468 compared to .131 respectively, as is shown in Table 1.

Table 1
Effect sizes for influence of ingroup and outgroup attitudes of the minority group on social integration

Term	ω^2
Attitude of minority to ingroup	0.131
Attitude of minority to majority	0.468

³ When the error term is zero in a model, this indicates that all the variance can be explained by the terms included in the model. In this case indeed adjusted R-square = 0.998

⁴ The omega-squared values were obtained by dividing the sum of squares of a term by the total sum of squares of the model. Note that in this case omega-square values would in fact be identical to the usually more biased and less preferred measure of effect size, eta-squared.

The second hypothesis expressed the expectation that group clustering would be related primarily to agents' attitudes towards their own group. This turned out to be the case. Just as the attitudes towards the outgroup were the main predictors of contact between the groups, the attitudes towards the ingroup best predicted contact within the groups, as measured by the clustering index. Table 2 shows the effect sizes of minority agents' attitudes towards their own group and the other group. It can be observed that the effect size connected to the attitudes to the own group is several times larger than that of the attitudes to the other group; 0.631 compared to 0.148, respectively.

Table 2
*Effect sizes for influence of ingroup and
 outgroup attitudes of the minority group on
 clustering*

Term	ω^2
Attitude minority to ingroup	0.631
Attitude minority to majority	0.148

The simulations were also predicted to produce a pattern of relationships between satisfaction and acculturation strategies that would be in accordance with findings from empirical studies: the integration strategy should lead to highest satisfaction, marginalization to the lowest, and assimilation and segregation somewhere in between.

Figure 2 shows the relationship between satisfaction and acculturation strategy for the minority, and the pattern is as predicted. The integration strategy leads to the highest levels of satisfaction, marginalization to the lowest, with separation and assimilation falling in between.

So far the predictions that were based on the commonalities between Berry's and the dynamical model were confirmed. Group clustering was caused primarily by the wish for contact with ingroup members. Social integration between the groups depended mainly on the preference for contact with the other group. The levels of satisfaction related to each acculturation strategy followed a similar pattern as found in studies on minority

psychological health and acculturation. The results that follow next will shed light on points on which the dynamical model differs from Berry's.

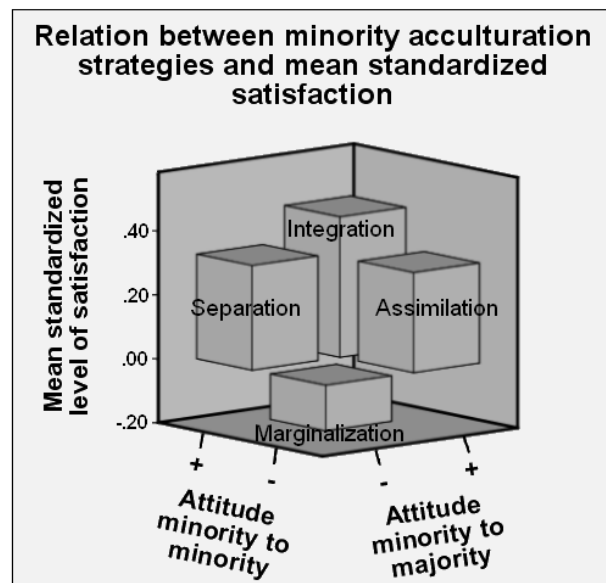
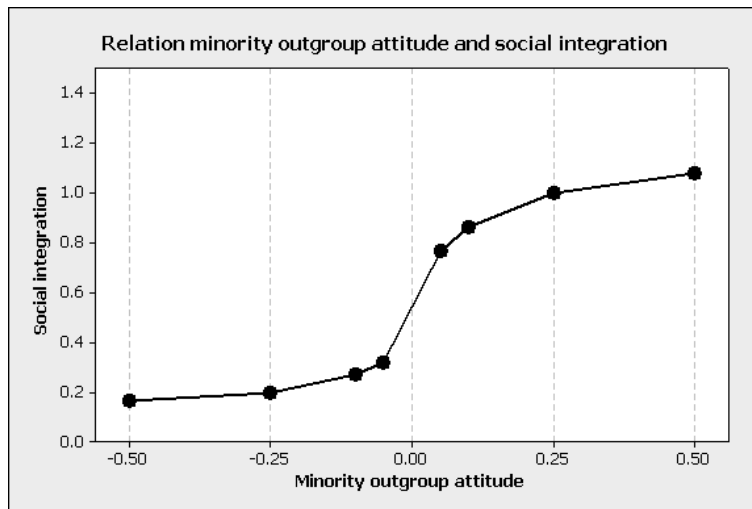


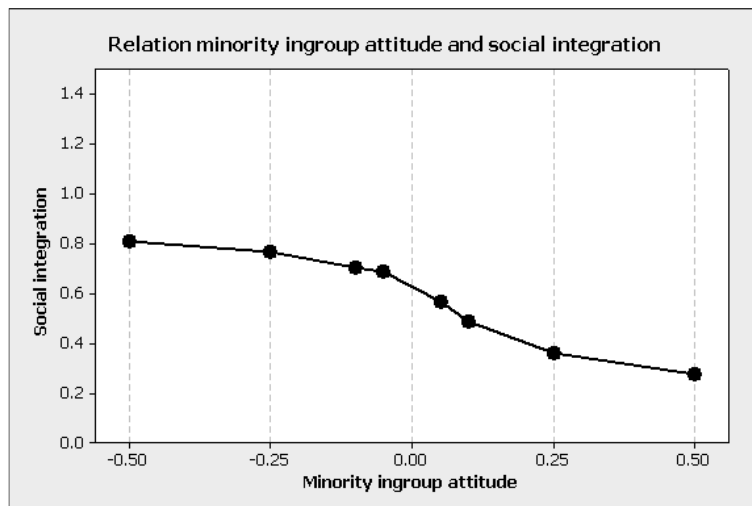
Figure 2. The relation between standardized satisfaction and minority acculturation strategies

Based on the notion that acculturation strategies possess unique and distinct properties, in the fourth hypothesis the expectation was expressed that the relationships between the attitudinal dimensions and social integration would be strongly non-linear. In a graphical representation of the main effects of ingroup and outgroup attitudes a non-linear pattern is expected to appear. As Figures 3a through 3c show, the results indeed lend credibility to this idea.

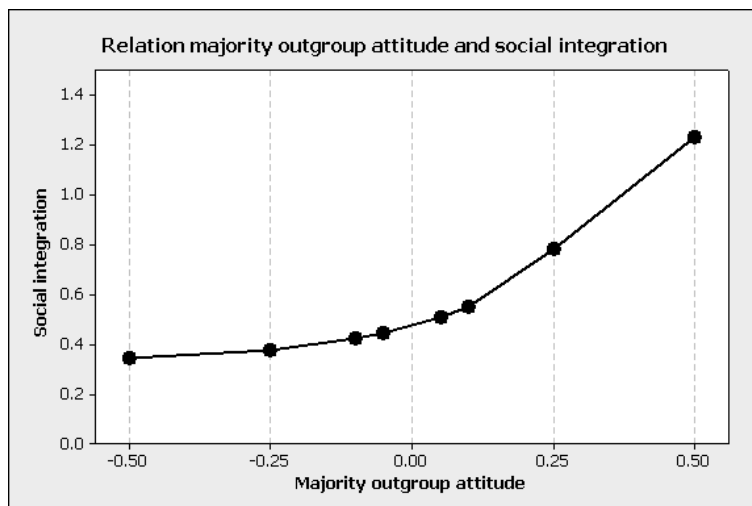
The graphs represent the relationship between ingroup and outgroup attitudes of the minority and the outgroup attitude of the majority, and social integration of both groups. In Figures 3a and 3b the relationship between outgroup- and ingroup attitude and social integration is displayed for the minority. The minority outgroup attitude is quite strongly non-linear, whereas the pattern connected to the minority's ingroup attitude approaches linearity. In Figure 3c, the relationship between social integration and the majority outgroup attitude is shown. The pattern shown is curvilinear although not very pronounced.



3a



3b



3c

Figure 3
Relationships between minority and majority ingroup and outgroup attitudes and social integration between the groups

Overall, the expectation of a non-linear effect of attitudes on integration is partly confirmed. The prediction of non-linearity was based on the notion that acculturation strategies have something unique about them that justifies not focusing on their underlying attitudes. This same notion lies at the basis of the prediction that for combinations of values of attitudes towards the ingroup and the outgroup that fall within the range of a single acculturation strategy, the same level of social integration should be observed. Because acculturation strategies are formed by combining the dimensions of ingroup and outgroup attitudes by their sign, not by their precise strength, for combinations of any values of positive ingroup and outgroup attitudes (i.e. integration strategy), very similar levels of social integration would be expected. The same would be expected to be true for any combination of negative-negative, positive-negative and negative-positive attitudes, irrespective of their magnitude.

If this were true, one first of all would expect to observe no interaction effects between the attitudes towards the ingroup and the outgroup. This would mean that the effect sizes of interaction terms of attitudes should be zero. Moreover, because identical results within acculturation strategies are predicted, in a visual representation of the combined effects of the two variables, a single line should be observed, not parallel lines. Parallel lines would indicate that, although the variables do not interact, the magnitude of social integration is dependent on the specific combinations of strengths of the attitudes.

A certain degree of interaction is present, however, indicating that the specific strength of an attitude is of importance for social integration. The effect size of this interaction of the ingroup and outgroup attitudes of the minority measures .100. This value is decidedly different from zero. Moreover, the size of this effect is comparable in magnitude to the minority ingroup attitude main effect.

These results show that in general there are different outcomes in terms of social integration caused by different attitude-value combinations within single acculturation strategies. The graphical representation of these interactions in Figure 4 provides a more detailed image of this interaction.

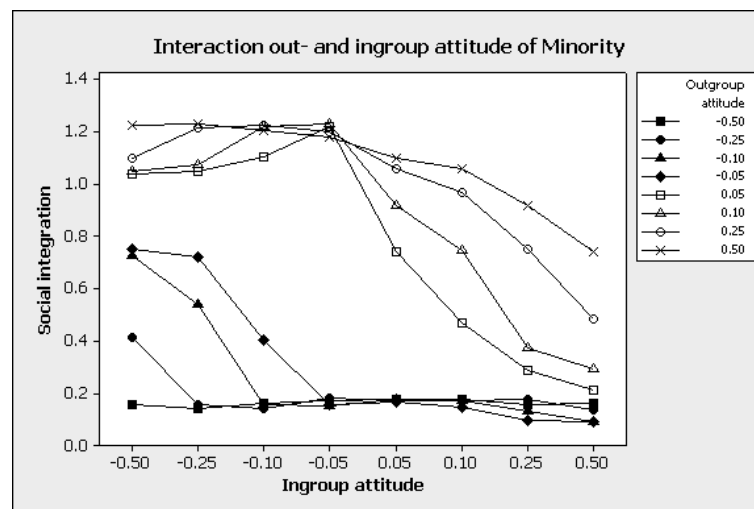


Figure 4.
Interaction effect of minority ingroup and outgroup attitudes on social integration between the groups.

It is noticeable that the relation between the attitudes and social integration follows a specific pattern, in that the interaction is not evenly present at all combinations of values of the attitudes, but at certain combinations only. To be more precise, only if the signs of the attitudes are congruent i.e. positive-positive or negative-negative, an interaction is observed. If the signs of the attitudes combined are opposites, little or no interaction occurs, and results are more similar, as can be seen by the converging lines. Figure 5 represents the relationship between combinations of different strengths of attitudes and social integration for the minority group and contains the same information as Figure 4 in a different shape. In Figure 5, if acculturation strategies were related to uniform outcomes, identical levels of social integration within each quadrant should be observed. For the assimilation and segregation strategies this seems to be more or less the case; for integration and marginalization, the outcomes are diverse and depend on the specific combinations of attitude strengths. A more

nuanced picture has emerged: the strategies made up of attitudes with opposite signs, segregation and assimilation, indeed seem to lead to uniform outcomes, whereas outcomes for strategies formed by attitudes of identical sign, integration and marginalization, are really dependent on the specific strength of those attitudes.

The sixth and last hypothesis pertained to the role of neutral attitudes in relation to acculturation strategies. It was expected that the effect of neutral attitudes would lie in the middle between those of the two closest related acculturation strategies. This however does not seem to be the case. The bars in Figure 5 display the extent of integration as a function of all the value combinations of the two attitudes of the minority.

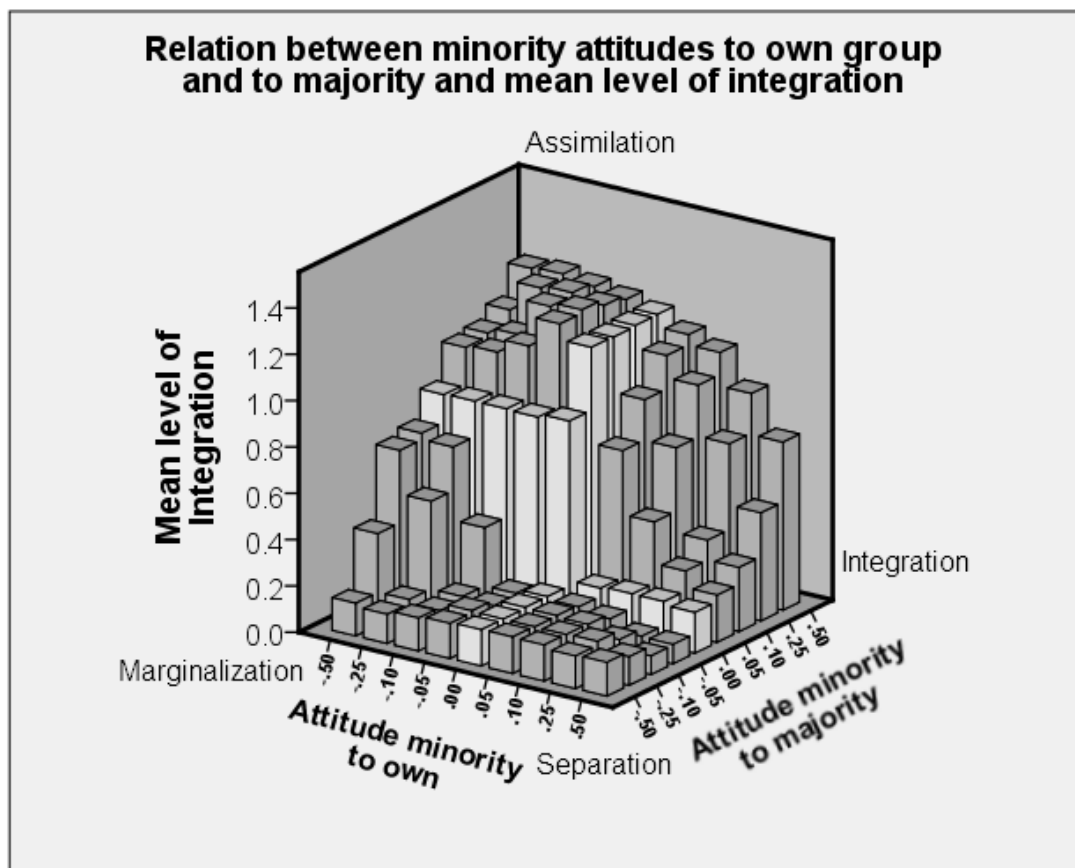


Figure 5
Relationship of minority ingroup and outgroup attitudes to mean levels of social integration between the minority and majority (neutral attitudes designated in white bars)

It is clear that if attitudes are neutral, represented by white bars, they are more closely related to the strategies of assimilation or segregation than to integration or marginalization, and so do not fall neatly in the middle between the strategies.

It should be noted that neutral attitudes are related to relatively uniform outcomes. The specific strength of the positive or negative attitude that is combined with the neutral attitude is of no influence on the rate of integration. For example, practically identical outcomes for each value of a positive minority attitude to own and neutral attitude to the majority are observed. In Figure 5 this can be seen by the near-identical height of the white columns. The results related to the strategy vs. the dimension approach provide a somewhat mixed picture. The separation and assimilation strategies are related to uniform outcomes, as was predicted. The pattern of outcomes related to the marginalization and integration strategies is diffuse however. Neutral attitudes were closely related to the assimilation and separation strategies, seeming to belong to these strategies rather than to integration and marginalization.

Discussion

The results of the simulations are largely supportive of the hypotheses. The observation that attitudes towards the other group are more strongly related to social integration than are attitudes towards the own group confirmed the expectations. Having a positive attitude to members of one's own group does not preclude contact with others, so it would have been surprising if results had shown otherwise. If we suppose this result to hold in reality, then it indicates that mutual positive attitudes should be one of the main objectives of attempts to bring about multicultural integration.

Attitudes towards the ingroup were the primary cause for agents of the same group to cluster together, as was predicted. These results might also be interpreted to suggest that it would be beneficial to simultaneously try to increase mutual positive attitudes between the

groups, and reduce people's liking of their ingroup members, because this would lessen clustering or segregation, and because ingroup attitudes are negatively related to social integration. It may be clear though that this would likely be unethical, and counterproductive.

The satisfaction levels connected to acculturation strategies in the simulations were in accordance with the pattern of psychological health levels related to acculturation strategies found in empirical studies. Although levels of satisfaction are not the main point of interest in the dynamical model, it is important that the results of the simulations and empirical studies conform on this matter. The levels of satisfaction are not as obviously related to acculturation strategies as, for instance, group clustering is related to preference for contact with ingroup members, which makes this outcome more significant. Because satisfaction is a core aspect of the dynamical model, in the sense that it relates agents' attitudes and their behavior, this result provides the model with important support.

In order to be able to say something more about the issue of whether we should focus on acculturation strategies or on the two dimensions underlying them, several hypotheses were tested. Especially the most important variable—minority outgroup attitude—was quite strongly non-linearly related to social integration, as was predicted on the basis of Berry's understanding of acculturation strategies. The other attitudes were approaching a more linear shape. This indicates that positive and negative attitudes can lead to quite different levels of social integration and can be seen as being related to qualitatively different outcomes. The non-linearity can be explained by the fact that positive attitudes are related to contact seeking behavior, while negative attitudes are not related just to less contact seeking, but to actual contact avoidance. This lends some credibility to the idea that acculturation strategies have something unique about them, and that it would thus make sense to focus on acculturation strategies instead of acculturation attitudes. However, the results discussed above provide

only indirect support because acculturation strategies result from combining the attitudinal dimensions, which was not specifically explored here.

If acculturation strategies are to be the unit of attention because of their unique properties, which would not be captured by looking at the attitudinal dimension alone, it would be expected that each of them is related to relatively unique and homogeneous outcomes. This turned out to be true only for the assimilation and segregation acculturation strategies, not for integration and marginalization. The segregation and assimilation strategies are constituted by a combination of two attitudes with opposite signs: assimilation combines a positive outgroup attitude with a negative ingroup attitude, segregation a negative outgroup attitude with a positive ingroup attitude. With both strategies, a clear choice has been made with which group contact is sought, and with which group contact is avoided. As a result, it does not matter what the precise strength is for either attitude. In the case of the integration and marginalization strategies, contact with both groups is sought or avoided, respectively. Because of that, the ingroup and outgroup “compete” for contact or avoidance. Here it matters which of the two attitudes is stronger, because that will indicate a relative preference for contact. As a consequence, different combinations of specific attitudinal values lead to different outcomes. For instance, if a person has a positive attitude towards both the ingroup and the outgroup, but has a relative preference for the ingroup, the result is that he or she will mainly socialize with ingroup members. If the relative preference were reversed, then this person would likely have more outgroup contacts.

The fact that there are no uniform outcomes for the integration strategy is of particular significance because it is by far the most popular acculturation strategy among immigrants (see Berry, 1997, for instance). Looking at the specific outcomes for the integration strategy, Figure 5 shows that the impact of each attitude on social integration is equally strong and linear. In order to confirm this observation and to get a very precise estimation of these

relationships a simple regression was run that showed that both attitudes indeed had an identical impact on social integration, as shown by their beta values. All in all, these results indicate that it might be wise to look at attitudes, rather than at the acculturation strategies, as explanatory variables for multicultural integration.

A last issue on the attitude-strategy debate concerns the role of neutral attitudes. By focusing on acculturation strategies, neutral attitudes are ignored because they do not clearly belong to any acculturation strategy. Our prediction, that outcomes related to neutral attitudes would lie halfway between the outcomes associated with the acculturation strategies most closely related to it, was not confirmed. With one attitude being neutral, outcomes were solely determined by the second attitude, which could only result in seeking or avoiding contact with the group that was subject of that attitude. When the second attitude was positive toward the outgroup, or negative toward the ingroup, then contact was only sought with the outgroup and high levels of intergroup mixing were observed. When the non-neutral attitude was positive toward the ingroup, or negative toward the outgroup, then only contact with the ingroup was sought, and low levels of intergroup mixing resulted. Outcomes connected to neutral attitudes therefore closely resemble those of the assimilation and segregation acculturation strategies. So, in addition to the fact that it is likely that people have neutral attitudes in real life, which is not captured by the strategy approach, it also appears that outcomes related to neutral attitudes can be quite different than what can be expected on the basis of the acculturation strategies that are closest to it. This provides another argument in favor of using attitudes over strategies when studying multicultural integration.

It could be objected that the concept adopted in the dynamical model essentially embodies the dimensional approach and that it is therefore a priori disqualified from being compared to the strategy approach. It is true that the focus lies on the quantitative aspects of the dimensions, having little eye for qualitative differences that could exist at the strategy

level. On the other hand the strategies *are* defined by the dimensions, and only the dimensions provide clear links to the behavioral aspects that are much needed to relate the model to social reality. So even if strategies possess qualities not easily expressed through the dimensions, they still get most of their substance from the dimensions that define them, because otherwise they would not be defined at all. In addition, Berry has remained rather unclear regarding what the qualitative aspects of strategies are that the dimensions lack, and on several occasions has opted for the dimensional approach himself (Berry & Sabatier, 2010; Donà & Berry, 1994; Sabatier & Berry, 2008). Without doubt the approach presented here does not capture all qualitative aspects of acculturation strategies, but I contend that there is sufficient ground for the model to be able to distinguish between the logical consequences that result from the different approaches.

Based on the results above it seems that there is support for both approaches. However, as long as it is not clearly specified what acculturation strategies have that the dimensions lack, and what the advantages of focusing on acculturation strategies are, there seem to be few reasons for focusing on strategies. Moreover, measuring strategies is more difficult than measuring the dimensions individually, and plagued by psychometric problems (Rudmin 2003; Rudmin & Ahmazadeh, 2001). The dimensions provide easily interpretable results on a continuous scale that, because of their precision—at least in the simulations—provide a more detailed picture of how people's attitudes are related to certain outcomes. The overall picture then seems to be tilted in favor of the dimensional approach.

Conclusions

The dynamical model has passed its first test. Simulation outcomes conform to what was expected based on the similarities with Berry's model. This is a strong indication that the foundations of the model are sound, and that further exploration is warranted. However

important this may be, the goal was not to just replicate known findings, but to go beyond what is known. It is very promising therefore that the dynamical model is able to contribute to the discussion of disputed topics.

Because the dynamical approach taken here is so different from existing approaches, it provides an entirely novel way to explore the logical consistency of the notions it was based on—Berry's model. The results of this different approach already became apparent during the formulation of the dynamical model, because the type of questions asked from a dynamical perspective are different. For example, the need to precisely define acculturation strategies resulted in a discussion of majority acculturation attitudes and how these differ from those of the minority.

The major contributions however come from the simulations. The dynamical model is extremely simple, including only a few variables, and in that respect is an impoverished version of Berry's model rather than an extension of it. Even so, this simple model provided rich and insightful results beyond what could be expected based on an intuitive understanding of the three variables it contains.

Simulations allow for the investigation of a virtually limitless numbers of conditions and so provide a way of analyzing the full range of options of a model; something that would be very difficult through empirical study. This makes it possible to view in a single glance how the model behaves within its entire scope and identify possible anomalies, inconsistencies or otherwise interesting results.

The promise of the dynamical model therefore is to explore terrain inaccessible by any other means. The model is not destined to replace existing models, as it is non-empirical. Its major purpose is to discover, to generate new ideas, to inform new hypotheses which in time can lead to new models. This dynamical approach to multicultural integration would

prove to be especially valuable therefore if simulation insights would be empirically verified and further developed into theory.

Chapter 4

Empiric validation of some basic assumptions of the Dynamical Model of Multicultural Integration

The dynamical model of multicultural integration has been constructed with care, using deductive logic and available social theory and findings. The overall credibility of the model and the simulation outcomes however can only be truly established if its assumptions and simulation outcomes are empirically verified. It should be anticipated that not every aspect of the model will be open for easy verification. One of the strengths of dynamical models is that they provide insights into dynamical processes that elude typical investigation. The flipside of this advantage is that these aspects of dynamical models are necessarily difficult to study in reality. If however direct support can be found for the most important principles underlying the model and the simulations, and for general patterns of outcomes that the simulations produce, then our confidence in the validity of the simulations and the social mechanisms observed in them would be greatly enhanced. In this chapter, a number of hypotheses will be investigated that test the model's central assumptions. In particular, close attention will be paid to those issues where the dynamical model deviates from Berry's model.

At the heart of the dynamical model lie people's acculturation attitudes. Although the model is based on Berry's acculturation strategies, they are interpreted in a different fashion. An important difference concerns the way in which the majority group's acculturation strategies are conceptualized. Berry's majority acculturation strategies are defined by two attitudes that both regard minority behavior. These attitudes are formulated in a way that they express a preference for how minority members should behave; they do not however express

a clear behavioral preference of the majority member him- or herself. As pointed out in chapter 2, having a preference for minority members to seek contact with the majority group is quite something different from having a personal preference to have contact with minority members. It is of course quite possible that both preferences are positive, but not necessarily so. It is conceivable that some people think minorities should socially integrate, but that they themselves would prefer not to have contact with them. Essentially, it seems that, as this attitude primarily concerns a preference for the behavior of others, it is not related to the person's own behavior, or at least not strongly. When it comes to the culture maintenance acculturation attitude, the situation is equally unclear. There is no doubt that people have an opinion whether minorities should maintain their cultural heritage or not, but how this opinion impacts their behavior towards minorities is an unanswered question.

Constructs such as acculturation attitudes and acculturation strategies are as useful as they are predictive of observable behaviors. Seeking, avoiding and maintaining contact are all behaviors, and so if Berry's acculturation attitudes are not related to behavior, they should in fact not be related to majority-minority contact at all. The relevance of this prediction thus goes beyond the question whether the dynamical model has been properly constructed. Berry's model of acculturation is long standing and dominant in the field of research on acculturation. Given the fact that acculturation strategies form the cornerstone of Berry's model, and that literally hundreds of published studies have included measures of acculturation strategies as dependent or independent variable, it would be surprising if it were observed that majority acculturation strategies are not related to social integration of majority and minority members, because it would imply a serious limitation of our understanding of majority acculturation.

A possible reason that this topic has escaped our notice up to this point is that majority acculturation in general has received little attention compared to minority acculturation.

Those studies that did focus on majority acculturation never directly related acculturation strategies to majority-minority contact, or even included measures of both simultaneously. One exception is a study by Piontkowski et al. (2000), in which acculturation strategies for the majority were measured and did not conform to predicted patterns of contact. However, in this study each acculturation attitude dimension was measured by only a single item with only two answer options. As such, acculturation strategies were defined by combining the two yes/no questions and were treated as a categorical variable.

In order to construct the dynamical model, a variable predictive of majority contact-seeking behavior was needed. Because the issues discussed above could not be readily resolved it was simply assumed that majority members have one general attitude or orientation towards minority members that is predictive of seeking contact with them. The main argument for this is that if people are perceived to have more positive characteristics and are liked, it is more likely that people will seek contact with them, or at least not avoid it when a natural opportunity for contact arises. This line of reasoning fits with findings from research on intergroup relations. It has been shown that having less prejudice towards an outgroup –which is indicative of a more positive attitude– leads to a higher number of outgroup friendships (Binder, et. al., 2009; Eller & Abrams, 2003; Herek & Capitanio, 1996; Levin, van Laar & Sidanius, 2003; Pettigrew, 1997), although the reverse effect has in general found to be stronger. But a general positive attitude towards outgroups has also been linked to outgroup contact (Islam & Hewstone, 1993; Turner, Hewstone & Voci, 2007).

If for the majority this general orientation exists, however, by analogy this orientation might also exist for the minority and should then be predictive of contact with the majority. For the majority this general attitude toward the minority serves as a proxy for the contact acculturation attitude; for the minority it should be expected therefore that the contact

acculturation attitude and the general orientation towards the majority are closely related to each other e.g. that they measure more or less the same construct. By the same token, a general orientation towards the own group for the minority should be predictive of contacts with own-group members and should be closely related to the culture maintenance acculturation attitude.

A second important difference in interpretation of acculturation strategies in the dynamical model regards the relationship between strategies and the underlying attitudes. The continuous attitudes are central in the dynamical model, whereas categorical strategies are preferred by Berry. The simulation results presented in the previous chapter showed that the extent of intergroup contact for minority members who adopted the integration strategy was not equal for all, but depended on the strength of their attitudes. More specifically, the amount of contact with the majority group was linearly related to the strength of each attitude, and both attitudes were of equal importance in determining the amount of contact. These simulation outcomes are in accordance with the interpretation adopted in the dynamical model, but external, empirical validation is needed to show that it is not just a result of the way the model was put together in the first place.

Hypotheses

The choice of opting for a general majority attitude towards the minority instead of Berry's majority acculturation strategies would be best justified if the following hypotheses would be empirically confirmed:

1. Majority acculturation attitudes as defined by Berry are not predictive of intergroup contact.
2. A general majority attitude towards the minority is predictive of intergroup contact.
3. A general attitude of the minority toward the majority is predictive of intergroup contact.

4. This attitude is closely related to the contact acculturation attitude.
5. A general attitude of the minority towards other minority members is predictive of intergroup contact.
6. This attitude is closely related to the culture maintenance acculturation attitude.

A last hypothesis refers to the relation between acculturation attitudes and social integration:

7. For minority members favoring the integration strategy, their extent of contact with the majority group can be linearly predicted on the basis of their two acculturation attitudes and both attitudes contribute equally to the prediction.

Because the first two of these seven hypotheses regard the majority and the remaining five regard the minority, different sources of data are needed. To test the predictions regarding the majority, archival data will be used, from a large-scale internet survey. The hypotheses regarding the minority will be tested on the basis of a survey conducted on a minority, immigrant group. The predictions regarding the majority will be tested first. After those findings are discussed the second study will be presented, and the remaining five hypotheses will be tested and discussed.

Study 1

To test the two first hypotheses, regarding the relation between Berry's majority acculturation attitudes and contact with minorities, existing archival data was used from the Longitudinal Internet Studies for the Social sciences (LISS) administered by CentERdata (Tilburg University, The Netherlands).

Design

The LISS panel is a representative sample of Dutch individuals who participate in monthly Internet surveys. The panel is based on a true probability sample of households drawn from the population register. Households that could not otherwise participate are provided with a computer and Internet connection. A longitudinal survey is fielded in the panel every year, covering a large variety of domains including work, education, income, housing, time use, political views, values and personality. More information about the LISS panel can be found at: www.lissdata.nl, or in Scherpenzeel and Das (2010).

For the present purposes, data from a survey wave on acculturation related issues was used. The number of native Dutch participants in this wave of the survey was 4462. For this analysis only a subset of the total number of items was used. Items were selected that were directly relevant to the hypotheses tested, and included measures of participants' acculturation attitudes according to Berry's conceptualizations, participants' general attitudes towards minorities and their social contacts with minority members.

Measures

Acculturation attitudes

Participants answered questions about one of the four largest minority groups in the Netherlands (Moroccans, Turks, Surinamese or Antilleans). The two acculturation attitudes were measured by two sets of eight items, resulting in a total number of sixteen items. Each set of eight questions was essentially asked twice: once in reference to the majority group, once in reference to the specific ethno-cultural group to which the questions referred. The questions were answered on a 7-point likert scale ranging from 1, "strongly disagree" to 7, "strongly agree".

The following items make up the contact acculturation attitude:

- *I consider it important that [minority group] shop in Dutch stores*
- *I consider it important that [minority group] have native Dutch colleagues*
- *I consider it important that [minority group] have native Dutch friends*
- *I consider it important that [minority group] children go to school with native Dutch children*
- *I consider it important that [minority group] watch Dutch television channels*
- *I consider it important that [minority group] parents raise their children in a Dutch manner*
- *I consider it important that [minority group] speak Dutch at home*
- *I consider it important that [minority group] celebrate Dutch feasts at home with their family*

The culture maintenance acculturation attitude was assessed by the following items:

- *I consider it important that [minority group] shop in [minority group] stores*
- *I consider it important that [minority group] have native [minority group] colleagues*
- *I consider it important that [minority group] have native [minority group] friends*
- *I consider it important that [minority group] children go to school with native [minority group] children*
- *I consider it important that [minority group] watch [minority group] television channels*
- *I consider it important that [minority group] parents raise their children in a [minority group] manner*
- *I consider it important that [minority group] speak [minority group] at home*
- *I consider it important that [minority group] celebrate [minority group] feasts at home with their family*

These English formulations were obtained from the English version of the LISS questionnaire; the original items were formulated in Dutch. Cronbach's alphas for the acculturation attitudes were .78 for the extent to which Dutch people wish minorities to be in contact with Dutch people and society, and .79 for the extent to which Dutch people support minority culture maintenance. For each participant, the average score was calculated over the items belonging together in order to obtain his or her acculturation attitude.

General orientation towards the minority

Fifteen items assessed participants' opinions of immigrants by asking to what extent they thought immigrants are or have:

- | | |
|--|-----------------|
| – Friendly | – Knowledgeable |
| – Tolerant | – Self-assured |
| – Good character | – Professional |
| – Good intentions | – Independent |
| – Reliable (in the sense of trustworthy) | – Skilled |
| – Warm | – Competitive |
| – Honest | – Intelligent |
| | – Efficient |

Answers were provided on a 5-point likert scale ranging from 1, “not at all” to 5, “very much so”. Again, participants answered these questions with regard to one of the four immigrant groups mentioned above.

These fifteen items seem to tap into different aspects of personal characteristics, namely warmth and competence, which are two universal dimensions people use when judging others (Fiske, Cuddy & Glick, 2006; Wojciszke & Abele, 2008). The first seven,

displayed in the left column, refer to the “warmth” of a person, reflecting characteristics important for moral, affective evaluation and judgment. The last eight items, in the right column, refer to a person’s “competence”, which is related to perceived ability.

It has been shown that these dimensions also underlie peoples’ perceptions of groups, and that they are predictive of behavior. In addition, it has been consistently shown that the warmth dimension is more important than the competence dimension (Fiske, Cuddy & Glick, 2006; Fiske, Cuddy, Glick & Xu, 2002; Wojciszke & Abele, 2008). Moreover, the warmth dimension is related to active behavioral consequences, whereas the competence dimension is related to passive behavioral consequences (Cuddy, Fiske & Glick, 2008).

For the current purposes of measuring an overall orientation towards, or liking of a minority, the warmth dimension is most relevant, and thus the first seven items are of most interest. However, in order to confirm this expected division of the items, an exploratory factor analysis with direct oblimin rotation was performed. The scree plot suggested a solution with two factors. Based on the eigenvalue criterion a third factor could have been identified, but with an eigenvalue of only 1.007 (just over the threshold of 1) a two-factor solution seemed better. The pattern matrix showed that as expected all first seven items primarily loaded on one factor (smallest loading .66, average loading .79; highest loading on second factor .30, average loading on second factor .11). The other eight items primarily loaded on the second factor (smallest loading .52, average loading .61; highest loading on first factor .37, average loading on first factor .26). The correlation between the factors was .40.

It seems thus that the two sets of items indeed can be grouped and measure different constructs. The Cronbach’s alpha of the scale that resulted from taking the first seven items together measured .92. For each participant, the average was taken of their answers on the

seven items to obtain their general orientation towards the minority group about which they answered the questions.

Contact variables

Relatively few items addressed intergroup contact in this survey, so results will be analyzed for each item separately. A distinction was made between amount of contact – quantity–and how this contact was experienced –quality. This distinction is also often made in the context of research on the contact hypotheses (see Binder et al., 2009, for instance). Both aspects of contact will be addressed in this analysis.

Frequency of contact with members of the group about whom questions were answered was measured by two items:

- *How often do you interact with [minority group] in your neighborhood?*
- *How often do you interact with [minority group] at work or in school?*

Both of these item were answered on a four-point scale ranging from 1, “never”, to 4, “often”, with an additional answer option 5, “not applicable”. The quality of contact was addressed by two items inquiring about how participants experienced the contact in the neighborhood and at school or work. Participants answered on a five-point scale from 1, “not at all positive” to 5, “very positive”. This question was only asked of those who indicated having contact with a minority.

Results

Linear regression models were used to test the hypotheses,. In all these models, if there were multiple variables that served as predictor, they were entered simultaneously. It was hypothesized that for the majority group Berry-like acculturation attitudes would not be

related to actual intergroup contact, but that a more general orientation towards minority members would.

To test the first claim, each of the contact variables was regressed on both acculturation attitudes, and each acculturation attitude was regressed on the five contact variables. Given the size of the sample in this study it should be expected that even small effects would reach levels of statistical significance, so in addition to measures of practical significance, additional measures should be used to judge the size of the effect. Therefore a better indicator for the present purposes is the amount of explained variance, generally expressed by adjusted R-square, which indicates the strength of a model's predictive value. It is thus expected that the regression models describing the relationships between majority acculturation attitudes and intergroup contact are characterized by low levels of explained variance.

This prediction turns out to be largely confirmed; all regression models have low predictive value, although the variables measuring quality of contact are weakly related to the acculturation attitudes. Table 1 shows how contact frequency and quality are predicted by the acculturation attitudes. Frequency of contact essentially cannot be predicted at all by the acculturation attitudes, as the percentage of explained variance is smaller than 1 for both frequency variables. Quality of contact can to a small extent be predicted by acculturation attitudes, and seemingly more so if this contact takes place at work or school, adjusted $R^2 = .085$, than in the neighborhood, adjusted $R^2 = .073$. Still, in both these cases the amount of explained variance is smaller than ten percent, which is quite low. In addition to the low predictive value, the direction of prediction of the contact attitude is surprising. The negative beta values suggest that more positive attitudes towards minority contact are related to decreased quality of contact. The regression coefficients also show that on all accounts the culture maintenance attitude, surprisingly, is more strongly related to contact than is the contact attitude.

Table 1

Four multiple linear regression models predicting majority contact quantity and quality with minority on the basis of majority group acculturation attitudes.

Dependent	Frequency of contact in neighborhood		Frequency of contact at work/school		Quality of contact in neighborhood		Quality of contact at work/school	
Predictors	β	Sig.	β	Sig.	β	Sig.	β	Sig.
Attitude to contact between groups	.018	.329	-.044	<.05	-.105	<.001	-.189	<.001
Attitude to minority culture maintenance	.074	<.001	.080	<.001	.282	<.001	.298	<.001
Model adjusted R ²	.006	<.001	.005	<.001	.073	<.001	.085	<.001

Table 2 shows how the majority group acculturation attitudes are predicted by all of the contact variables. The regression model predicting the acculturation attitude regarding intergroup contact does reach statistical significance, $p < .05$, but the model explains less than one percent of the variation, which is very low. The model predicting the culture maintenance attitude also reaches significance, $p < .001$, but all these contact variable together can only explain about eight percent of the variation, which is low as well.

Table 2

Two multiple linear regression models predicting majority acculturation attitudes on the basis of contact variables

dependent	Attitude to contact between groups		Attitude to minority culture maintenance	
predictors	β	Sig.	β	Sig.
Frequency of contact in neighborhood	-.035	.337	.010	.781
Frequency of contact at work/school	-.023	.531	-.016	.646
Quality contact in neighborhood	.006	.904	.181	<.001
Quality contact at work/school	-.095	<.05	.127	<.01
Model adjusted R ²	.008	<.05	.075	<.001

All in all it appears that, in line with the predictions, for the majority group, Berry's acculturation attitudes are only weakly related to variables measuring majority group contact

with the minority. Alternatively it was predicted that a general orientation towards the minority would be more strongly related with intergroup contact. Thus, the levels of explained variance connected to the majority's general orientation towards the minority should be markedly higher than the levels of explained variance connected to Berry's acculturation attitudes.

In order to make this comparison, the exact same regressions models were constructed, with the difference that the acculturation attitudes were substituted by the general orientation towards the minority. As predicted, the general orientation towards the minority is related to contact stronger than Berry's acculturation attitudes. Table 3 shows how frequency and quality of contact are predicted by the majority orientation towards the minority. Especially contact quality variables are a lot better predicted: adjusted R square equals .21 for quality of contact in the neighborhood and .17 for quality of contact at work or school. So, about twenty percent of the variation in these variables can be explained by the majority orientation towards the minority, compared to less than ten percent explained variance by the acculturation attitudes. Frequency of contact is not well predicted by this variable either, however. The adjusted R-square values observed are as dramatically low as those observed for the acculturation attitudes.

Table 3

Four linear regression models predicting majority contact quantity and quality with minority on the basis of the majority group general orientation towards the minority

Dependent Predictor	Frequency of contact in neighborhood		Frequency of contact at work/school		Quality of contact in neighborhood		Quality of contact at work/school	
	β	Sig.	β	Sig.	β	Sig.	β	Sig.
General orientation to minority	.109	<.001	.038	<.05	.457	<.001	.415	<.001
Model adjusted R ²	.012	<.001	.001	<.05	.208	<.001	.172	<.001

In line with the predicted pattern of results, the majority's orientation towards the minority is relatively well predicted on the basis of the contact variables, as can be seen in Table 4. Adjusted R square is .270 compared to .075 for the best predicted acculturation attitude. Again, the variables concerning the quality of contact between minority and majority members are the most important predictors in this model.

Table 4
Multiple linear regression model predicting majority orientation towards minority on the basis of contact variables

dependent predictor	Orientation to min	
	β	Sig.
Freq. contact in neighborhood	.062	<.05
Freq. contact at work/school	-.037	.238
Quality contact in neighborhood	.289	<.001
Quality contact at work/school	.276	<.001
Model R ²	.270	<.001

Discussion

The most striking outcome of these analyses is that Berry's majority acculturation attitudes were only very weakly related to actual contact with minority members. In addition, opposite to what would be expected, the contact acculturation attitude showed signs of being *negatively* related to contact; more positive attitudes about minorities having contact with the majority were related to *lower* quality of contact with minority members. This outcome did not reach high levels of significance though, and maybe should be best regarded as random variation.

These findings indicate that the predictive value of the majority acculturation attitudes as defined by Berry might be limited, at least when it comes to social contact. The definition of acculturation specifies that it results from continuous first-hand contact between groups (Redfield et al., 1936). If these acculturation attitudes are not strongly related to intergroup contact, then to what extent are they related to acculturation at all?

The choice to make use of a general orientation towards the minority in the Dynamical Model, measured by people's judgments of a number of personal characteristics of majority members, is supported by the findings, although the relationship is not very strong. This general orientation is related more strongly to contact with the minority, and thus seems to be a more useful variable in understanding acculturation processes than Berry's majority acculturation attitudes.

It should be noted, however, that mainly the quality aspect of majority-minority contact was predictive of the majority's orientation towards the minority. This is not very surprising; similar findings have been reported in several other studies that were related to contact effects (Binder et al., 2009; Brown et al., 2001; Eller & Abrams, 2003, 2004; Greenland & Brown, 1999; Stephan, Diaz-Loving, & Duran, 2000). The importance of this finding is that it is indicative of the direction of causality between the majority's orientation and contact with minority. For the relationship between prejudice and contact it has been shown that causality is bi-directional, and that the link from contact to prejudice is stronger than vice versa (Brown & Hewstone, 2005). The same situation seems to apply to the relationship between the majority's orientation and majority-minority contact. This would then essentially mean that majority members do not take much initiative in seeking contact with minorities. Moreover, it may well be that people with very negative attitudes actively avoid contact, but those with positive contact do not actively seek contact.

If this is true then it tells us some important things about majority acculturation; it would seem that at best majority members look at minorities without regard for them being of a different group, having an equal attitude towards them as towards other majority members. Also it would mean that the active contact seeking behavior by majority agents in the simulations may be unrealistic, at least on the basis of the attitudes that were tested in this analysis. All in all, many questions remain concerning majority acculturation, even to the

point that one may ask what majority acculturation actually entails. It is clear that acculturation processes for minority and majority members are very different. For minorities, acculturation impacts virtually all aspects of their life, but to what extent are majority members affected by acculturation in their daily life? What does it mean to them?

Berry's duplication of the minority acculturation strategy framework for the majority certainly has face validity, but the results presented here suggest that some adjustment may be needed. Other variables are known to be relevant to majority-minority contact, such as prejudice, perceived threat, affective measures, attitudes, support for multiculturalism, perceived differences, and many more, but no coherent picture as yet has appeared that comprehensively summarizes the majority's position on acculturation. The measures used in this study are not proposed to in any way replace existing measures, but to serve as a very basic alternative, which is assumed to exist for both majority and minority. The main objective of this analysis however was the head to head comparison of Berry's attitudes with an alternative measure, in order to clarify some issues that came up during the development of the dynamical model.

Even though majority acculturation is important to the dynamical model, the lack of clarity should not invalidate it. In the model, the majority agents' behavior ranges from contact avoidance to contact seeking. If it turned out, for example, that the majority avoids contact, but does not seek contact with the minority, this would mean that the range of majority behavior might have to be restricted a little, but not that the model be fundamentally changed. Practically this would mean that attitude values in the model should not be allowed to be positive for the majority.

In order to test the expectations regarding the minority group, a survey study was conducted on a group of Iranian immigrants in Sweden. The expected outcomes for this study

were stated in hypotheses 3 through 7. Analogous to the predictions regarding the majority group, for the minority it was expected that (keeping the original numbering of hypotheses):

3. A general attitude of the minority toward the majority is predictive of intergroup contact
4. This attitude is closely related to the contact acculturation attitude
5. A general attitude of the minority towards other minority members is predictive of intergroup contact
6. This attitude is closely related to the culture maintenance acculturation attitude

The last hypothesis regarded the linear relationship between attitude strength on both dimensions and the extent of social integration for minority members favoring the integration acculturation strategy:

7. For minority members favoring the integration strategy, their extent of contact with the majority group can be linearly predicted on the basis of their two acculturation attitudes and both attitudes contribute equally to the prediction.

Study 2

A survey was conducted on 104 Iranian immigrants in Sweden, who were born in Iran or were second generation immigrants. Participants were recruited through informal social and communication networks between Iranians in Sweden. They were aged between 21 and 91, with a mean age of 40.79 years ($SD = 14.55$). Of these, 49.4% were female and 50.6% male. The average length of stay in Sweden was 19 years ($SD = 6.34$) for those born in Iran. Two persons were excluded from the analysis because so many items were left blank that for these participants scores on important variables could not be calculated. An additional person was excluded for providing mutually exclusive answers and not filling out a third of the questionnaire.

Instruments

A questionnaire measuring the following variables was translated from English into Farsi and Swedish by native speakers. The translations were then reviewed by different native speakers and any resulting issues were resolved between the translators. Participants could thus choose in which language they preferred the questionnaire.

Acculturation attitudes

Attitudes towards the majority group and culture and heritage group and culture were measured using items from the LISS questionnaire that was used in study 1. The reason to adopt identical items was to ensure good comparability between the findings of both studies. As in the previous study, acculturation attitudes were measured by the following 2 sets of 8 items. Each item was presented twice; once in reference to the majority group, once in reference to the ethno-cultural group. The items were answered on a 7-point likert scale ranging from “strongly disagree” to “strongly agree”.

- *I consider it important to shop in Swedish/Iranian shops*
- *I consider it important to have Swedish/Iranian colleagues*
- *I consider it important to have Swedish/Iranian friends*
- *I consider it important that Iranian children go to school with Swedish/Iranian children*
- *I consider it important to watch Swedish/Iranian television channels*
- *I consider it important that Iranian parents raise their children in a Swedish/Iranian way*
- *I consider it important to speak Swedish/Persian(Farsi) at home*
- *I consider it important to celebrate Swedish/Iranian feasts at home with my family*

These English items were obtained from the English version of the LISS questionnaire.

Cronbach’s alpha for the scale measuring attitudes towards Swedes and Swedish culture

measured .78; for the scale measuring attitudes towards Iranians and the heritage culture Cronbach's alpha was .83.

General orientation towards Swedes and towards Iranians

To make comparisons with the results from the LISS survey as best as possible, use of the same seven items that were used to construct the general orientation scale earlier was attempted. The item inquiring about “reliability” (in the sense of trustworthiness) proved difficult to translate while maintaining the original Dutch meaning of “betrouwbaar”, and therefore it was decided to remove the item from the scale. The items covering the issues of honesty, good intentions, and good character were deemed to sufficiently cover the content of the dropped item so that resulting scores would not much differ in their meaning. The six items used to assess Iranians general orientation towards Swedes and Iranian Immigrants in Sweden were thus as follows:

- Friendly
- Tolerant
- Good character
- Good intentions
- Warm
- Honest

Answers were provided on a 7-point scale ranging from 1, “not at all”, to 7, “very much”.

Cronbach's alpha was .88 for the scale referring to Swedes, and .89 for the scale referring to Iranians.

Social contact

Two aspects of social contact with Swedes and Iranians were measured: Frequency of contact and quality of contact. The distinction between these two aspects of contact has been made in previous research on the contact hypothesis (Binder et al., 2009), because high quality contact was presumed to be more effective in reducing prejudice. Some of the items used in Binder et al.'s study were adopted for this study.

Quantity of contact with each group was measured by five items, inquiring about frequency of contact in the neighborhood, at work or school, during leisure, and the number of friends and frequency of contact with friends. The items measuring frequency of contact were rated on a 5-point scale ranging from “never” (“rarely” when referring to friends) to “very often”. The number of friends was measured with a 6-point scale, ranging from “0” to “more than 9”. The last item was later transformed to fit with the other items. Cronbach's alpha for this scale measured .86 for contact with Swedes and .83 for contact with Iranians. The first two items, inquiring about frequency of contact with Swedes in the neighborhood, and at school/work were taken from the LISS questionnaire, though transformed to a 5-point scale. A third item regarding contact during leisure time was added. The items referring to contact with friends were adopted from Binder et al. (2009).

Measures of quality of contact informed how interactions in the neighborhood, at school or work and during leisure time were being experienced. A 5-point scale was used ranging from “negative” to “positive”. With regard to friends, two items with a 5-point scale inquired about the closeness and equality of these relations. The scales ranged from “distant to me” to “close to me” and “not equal to me” to “equal to me”, respectively. Cronbach's alpha for this scale was .82 for Swedish contacts and .83 for Iranian contacts. Again, the first three items are adaptations of items used in the LISS questionnaire; the last two items were taken from the questionnaire used by Binder and colleagues (2009).

Results

The data were mainly analyzed using multiple linear regressions, but correlations were calculated with regard to the relatedness of general attitudes and acculturation attitudes. Before testing the hypotheses, the relation between minority acculturation attitudes and contact variables will be analyzed to confirm if, in contrast with the majority, these variables are related to each other.

According to the principles on which the dynamical model is based, the contact attitude of this sample should be related to contact with Swedes, and the culture maintenance attitude should be related to contact with Iranians. As Table 5 reveals, this is indeed the case: each attitude is significantly related to contact with the group it is primarily concerned with. Twenty seven percent of the variance of the quantity of contact with Swedes was explained by the two acculturation attitudes, with the contact attitude being the strongest predictor ($\beta = .471$ compared to $-.324$). Of the qualitative aspects of this contact, 30 percent of the variance was explained, with the contact attitude again being the strongest predictor ($\beta = .557$ compared to $-.204$). In both cases, the beta values for the contact attitude were significant at the .001 level. Eight percent of the variance of contact with Iranians, and 3 percent of variance of the quality of that contact were explained by the acculturation attitudes. In these models, the culture maintenance attitude reached levels of significance of .01 and .05 respectively. The contact attitude did not reach significance in these models. It has to be acknowledged that even though contact with Iranians could be to some extent predicted, the percentages of explained variance are quite low.

Table 5

Four multiple linear regression models predicting contact quantity and quality with Swedes and Iranians on the basis of the contact and culture maintenance acculturation attitudes

Dependent	Amount of contact with Swedes		Quality of contact with Swedes		Amount of contact with Iranians		Quality of contact with Iranians	
Predictors	β	Sig.	β	Sig.	β	Sig.	β	Sig.
Contact attitude	.471	<.001	.557	<.001	-.159	ns	.053	ns
Cultural maintenance attitude	-.324	<.001	-.204	<.020	.294	<.010	.205	<.050
Model adjusted R ²	.266	<.001	.304	<.001	.079	<.01	.028	<.10

The analysis of the majority group has shown that the quality aspect of contact is a better predictor of attitudes than is the quantity of contact. Because such findings are relevant for the interpretation of the direction of causality between the variables, a similar analysis will be performed next. In order to see how contact quantity and quality predict the contact and culture maintenance attitudes, each attitude was regressed on the contact variables of the group the attitude is primarily concerned with. Thus, the contact attitude was regressed on the variables measuring contact with Swedes, and the culture maintenance attitude was regressed on the variables measuring contact with Iranians. The results of this analysis are presented in Table 6.

As for the majority group analyzed previously, for Iranians the contact acculturation attitude is predicted mainly by the quality aspects of contact with Swedes ($\beta = .640$, $p < .001$). The twenty five percent of the explained variance can only be attributed to this variable, as the quantity of contact did not reach a level of significance in this model ($\beta = -.087$, ns). The culture maintenance attitude by contrast seemed to be predicted stronger by the amount of contact with Iranians ($\beta = .243$, $p < .06$), than by the quality of this contact ($\beta = .072$, ns). It should be noted however, that although the overall model was significant ($p <$

.02) the total amount of explained variance, 6.5 percent, was low, and that quantity of contact was only marginally significant.

Table 6

Two multiple linear regression models predicting the contact acculturation attitude on the basis of contact quality and quantity with Swedes and) the culture maintenance acculturation attitude on the basis of contact quantity and quality with Iranians

dependent predictors	Contact attitude		Culture maintenance attitude	
	β	Sig.	β	Sig.
Amount of contact with Swedes	-.087	<i>ns</i>		
Quality of contact with Swedes	.640	<.001		
Amount of contact with Iranians			.243	<.060
Quality of contact with Iranians			.072	<i>ns</i>
Model adjusted R ²	.248	<.001	.065	<.020

Now that the basic relationships between the acculturation attitudes and the contact variables have been clarified, the stated hypotheses will be tested. According to hypotheses three and five, similar predictions were made for the general attitudes towards Swedes and Iranians as for the contact and culture maintenance acculturation attitudes: the general orientation towards Swedes should be related to contact with Swedes, and the general orientation towards Iranians should be related to contact with Iranians.

This is exactly what was found, and is represented in Table 7. Each orientation is significantly and only related to contact with the group it is primarily concerned with. Seventeen percent of the variance of the quantity of contact with Swedes was explained by the two orientations, with only the orientation towards Swedes being significant: $\beta = .418$ ($p < .001$) compared to $\beta = .021$ (*ns*) for the orientation towards Iranians. Of the qualitative aspects of this contact, 32 percent of the variance was explained, with the orientation towards Swedes again being the only significant predictor ($\beta = .557$, $p < .001$ compared to $\beta = .010$, *ns*, for the orientation towards Iranians).

Six percent of the variance of contact with Iranians, and 22 percent of variance of the quality of that contact was explained by the orientations. The amount of contact with Iranians was only significantly predicted by the orientation towards Iranians ($\beta = .288, p < .01$), although the orientation towards Swedes was close to reaching a level of significance as well ($\beta = -.183, p < .10$). The quality of contact with Iranians was clearly only predicted by the orientation towards Iranians ($\beta = .485, p < .001$, compared to $\beta = .002, ns$, for the orientation towards Swedes).

Table 7

Four multiple linear regression models predicting contact quantity and quality with Swedes and Iranians on the basis of general orientations towards Swedes and Iranians

Dependent	Amount of contact with Swedes		Quality of contact with Swedes		Amount of contact with Iranians		Quality of contact with Iranians	
Predictors	β	Sig.	β	Sig.	β	Sig.	β	Sig.
General orientation to Swedes	.418	<.001	.557	<.001	-.183	<.10	.002	ns
General orientation to Iranians	.021	ns	.010	ns	.288	<.010	.485	<.001
Model adjusted R ²	.165	<.001	.324	<.001	.056	<.05	.220	<.001

In order to make the comparison between general orientations and acculturation attitudes as complete and systematic as possible, a regression model was run in which the contact variables were used to predict the general orientations. It was previously observed that the quality of contact was the strongest predictor for Dutch majority orientations towards different minority groups and for the acculturation attitudes of the Iranian minority in Sweden. Therefore it seems most plausible to assume that a similar pattern will be found for the general orientations of the Iranian minority tested.

The regressions presented in Table 8 show that the same pattern was indeed found. The orientation towards Swedes was only significantly predicted by quality of contact with Swedes ($\beta = .653, p < .001$), and not by the quantity of contact with Swedes ($\beta = -.091, ns$).

Similarly, the orientation towards Iranians was predicted only by the quality of contact with Iranians ($\beta = .548, p < .001$) and not by the quantity of contact with Iranians ($\beta = -.107, ns$). The amount of variance in the orientation that could be explained by the contact variables measured 33 percent for the orientation towards Swedes and 23 percent for the orientation towards Iranians. These percentages are markedly higher than for the acculturation attitudes, as can be seen in Table 6.

Table 8

Two multiple linear regression models predicting the orientation towards Swedes on the basis of contact quality and quantity with Swedes and the orientation towards Iranians on the basis of contact quantity and quality with Iranians

dependent predictors	Contact attitude		Culture maintenance attitude	
	β	Sig.	β	Sig.
Amount of contact with Swedes	-.091	ns		
Quality of contact with Swedes	.653	<.001		
Amount of contact with Iranians			-.107	ns
Quality of contact with Iranians			.548	<.001
Model adjusted R ²	.326	<.001	.227	<.001

Because it was expected that both acculturation attitudes and general orientations would be successful predictors of social contact, it was hypothesized that each acculturation attitude and its corresponding general orientation would be closely related. Hypotheses four and six would be confirmed therefore if the amount of shared variance between the corresponding variables would be high. Table 9 shows the correlations between the attitudes and the orientations. The correlations show that, as expected, the corresponding variables to some extent converge: the orientation towards Swedes correlates quite strongly with the contact attitude ($r = .552, p < .001$), whereas it does not show a correlation with the cultural maintenance attitude ($r = -.039, ns$). Similarly, the orientation towards Iranians is moderately related with the cultural maintenance attitude ($r = .326, p < .01$), and much less so with the contact attitude ($r = .211$), although this correlation is marginally significant ($p < .06$).

Table 9
*Correlations between minority general orientations
and acculturation attitudes*

variable	Orientation to Swedes	Orientation to Iranians
Contact attitude	.552***	.211*
Culture maintenance attitude	-.039	.326**

Note: * $p < .06$, ** $p < .01$, *** $p < .001$

To reveal the amount of shared variance between the variables, these correlation values need to be squared. The contact attitude thus shares 30 percent of its variance with the general orientation towards Swedes ($R^2 = .3047$) and the contact maintenance attitude shares 11 percent of its variance with the general orientation towards Iranians ($R^2 = .1063$). It thus seems that to quite some degree the contact attitude and the orientation towards Swedes are based on a common construct, but that the culture maintenance attitude and the orientation towards Iranians are related to rather different things.

The seventh and last hypothesis to be tested, based on simulation results, predicted that for minority members favoring the integration strategy, the extent of contact with the majority group can be linearly predicted on the basis of their two acculturation attitudes and that both attitudes contribute equally to the prediction. Eighty five of the 101 participants in the study favored the integration strategy, as indicated by their both positive culture maintenance and positive contact attitudes (this in practice means having a score higher than 4; the value that delineates the border between a positive and a negative attitude).

The expectations were tested using two multiple regression models, each with a Swedish contact variable (quantity, quality) as dependent variable and both acculturation attitudes as predictors. It was expected that both models would reach levels of statistical

significance, meaning that successful predictions can be made, and that the absolute beta values of the predictors have approximately the same size.

Table 10 shows that indeed both models do make successful predictions of contact with Swedes based on the acculturation attitudes, as indicated by adjusted R-squared values that are significant at the .001 level. However, the prediction that both attitudes contribute equally to the prediction does not seem to hold. In the prediction of the quantity of contact with Swedes, the absolute beta value for the contact attitude was .610 and for the culture maintenance attitude .418; not a very big difference, but clearly not equal. The difference between the absolute beta values was larger for the prediction of quality of contact with Swedes though; the absolute beta for the contact attitude was .509 and for the culture maintenance attitude .202.

Table 10
Two multiple linear regression models predicting contact quantity and quality with Swedes on the basis of acculturation attitudes for minorities with the integration acculturation strategy

dependent	Quantity of contact with Swedes		Quality of contact with Swedes	
predictor	β	Sig.	β	Sig.
Contact attitude	.610	<.001	.509	<.001
Culture maintenance attitude	-.418	<.001	-.202	<.050
Model adjusted R ²	.398	<.001	.228	<.001

Discussion

The hypotheses regarding the relationship of minority attitudes with social contact and acculturation attitudes were generally supported by the findings. As expected on the basis of simulation results, both ingroup- and outgroup-attitudes were predictive of Iranians' contacts with Swedes. It is important that this was confirmed using linear models, because this fits best with the notion of continuous attitude scales and not with the categorical, strategy approach. These findings thus support an important assumption of the dynamical model.

The specific prediction that both attitudes would be equally strongly related to contact with the majority group for those having positive attitudes towards contact and culture maintenance—the integration acculturation strategy—was not entirely supported however. The empirical findings might not be very surprising, given the fact that contact with the outgroup is the variable most closely related with the contact attitude. The explanation for the difference between the simulation and empirical results most likely lies in the limitations of the simulated social space. In the simulations, the maximum number of contacts is limited to eight, and so there is a very strict trade-off between the number of ingroup and outgroup contacts. Given the fact that an attitude towards a group is causally related to contact with members of that group, combined with the trade-off between the number of contacts of both groups, means that the attitude towards one group not only impacts the number of contacts with that specific group, but also the number of contacts with the other group. Because the negative relationship between the amounts of contact with both groups is likely to be more moderate in reality, each attitude primarily impacts the number of contacts with its specific group and they are to a larger extent decoupled from the amount of contact with the other group. This argument cannot be related to quality of contact, which may be the reason that the acculturation attitudes are even more decoupled for this variable.

Unlike the results discussed above, the results showed that minority general orientations are related only to contact with the group the orientation relates to. Contact with Swedes was predicted only by Iranians' orientation towards Swedes, not by their orientation towards Iranians. The amount of explained variance was comparable to that of both acculturation attitudes combined with regard to the quality of contacts with Swedes, but a bit lower for the amount of contact. Contact with Iranians was related to the orientation towards Iranians quite a bit more strongly than it was related to the culture maintenance attitude. This

difference was the result of a much stronger link of the orientation towards Iranians with the quality of contact with Iranians.

When looking more closely at the amounts of explained variance in social contacts, it becomes apparent that compared to contact with Swedes, contact with Iranians is not as strongly related to the general orientation, and is particularly weakly related to the acculturation attitude. This might be an indication that contacts with the majority are motivated by different reasons than are contacts with ingroup members.

Despite the differences, the overall picture that emerged is that minority general orientations and acculturation attitudes are both predictive of social contacts. The correlation of these variables was weaker than expected, however. The correlation was only moderate for the contact attitude and the orientation towards Swedes, and rather weak for the culture maintenance attitude and the orientation towards Iranians. This indicates that, although roughly equally predictive of social contact, these variables have different underlying constructs.

One thing they nonetheless have in common is that they are generally much more strongly (or even only) predicted by the quality aspects of contact than by the amount of contact. As mentioned before, this result fits with previous findings of studies on the contact hypothesis, but it raises the question (again), to what extent acculturation attitudes and orientations make people seek contact, or if they are mainly a result of social contact.

Overall, the outcomes of the analyses presented in this chapter fit the conceptualization of the dynamical model as it was outlined in chapter two. Crucially, the choice not to follow Berry's formulation of majority acculturation attitudes, but to make use of a more general orientation towards the minority, was supported by the findings. These general orientations also were shown to be reliable predictors if used for a minority group. The orientations, and

for the minority group also the acculturation attitudes, may safely be assumed to be linear, fitting the way that the dynamical model was conceptualized.

The analysis was mainly aimed at providing support for the dynamical model, but the findings have important theoretical relevance as well. It was observed that majority acculturation attitudes were not predictive of contact with minorities, that all attitudes and orientations are themselves primarily predicted by quality aspects of contact, which questions the notion of these variables as causal factors, and that the minority culture maintenance attitude and general orientation towards their own group were relatively weakly related to ingroup contacts. All these findings together raise questions regarding acculturation attitudes as explanatory variables of acculturation.

What seems certain is that acculturation attitudes are different for the majority and the minority. Moreover, for the minority they seem to be different when regarding the majority group and the ingroup. But if they are different, then in what respects are they different, and in which respects are they the same? Conceptually, the attitudes have not been defined very precisely, and an answer can thus not be readily provided on conceptual grounds. Empirically, the attitudes have been operationalized in different ways, based on a variety of interpretations, and so no clear answer can be based on this either. The problem is that without a clear definition and operationalization we do not precisely know what we are studying. Comparable criticisms of research on acculturation attitudes and strategies have been voiced in the past (Rudmin, 2003, 2009).

Perhaps it would be a good idea to start from readily measurable and observable behaviors that are fundamental to acculturation, such as contact seeking, contact maintaining and contact avoidance, and look at the correlates of these behaviors. Step by step an explanatory framework could be constructed, including motivations, beliefs, prejudices, feelings, etc., that over time should also include knowledge about the direction and strength

of causality. Such a framework would clearly not be as simple as Berry's framework, but it would be useful.

Chapter 5

Simulations of scenarios of multicultural integration

The simulation study reported in chapter three clarified several issues regarding the internal consistency of Berry's acculturation model and tested the credibility of the dynamical model of multicultural integration. The conformity of the simulation outcomes and known empirical findings provided a basis of confidence which allows for further investigation of multicultural integration with the dynamical model.

So far the analyses have focused mainly on the relationships between the most important variables in the model. This is certainly interesting from a theoretical perspective, but ultimately the goal is to understand real processes of multicultural integration. The logical next step then is to focus on specific social scenarios and analyze them with the help of computer simulations. The specific question of interest is how, based on their attitudes, the interaction between agents shape the resulting pattern of intergroup relations over time.

In this chapter two series of simulation studies will be presented, focusing on a number of prevalent acculturation situations or scenarios. The simulations will start out simple and increase in complexity in the next series. The first series of simulations will be closely connected to Berry's approach, in which the relationship between multicultural integration and acculturation attitudes will be visualized and analyzed, with the level of analysis at the group level, i.e. groups will be regarded as homogeneous with respect to their attitudes. The second series of simulations will go beyond Berry's model in an important way.

It is clear that analyzing intergroup relationships solely at the group level can only result in a relatively coarse understanding of social reality. A much more fine-grained understanding would be obtained if individual differences could be taken into consideration

when looking at multicultural integration. Even though this is theoretically evident, it has so far been hard to take individual, micro-level variation into account when trying to analyze macro-level intergroup phenomena. Computer simulations make such a thing possible however, and thus a natural next step is to introduce individual differences into the model.

At a general level, in the analysis of the second series of simulations the relationship between attitudes and individual differences in these to multicultural integration will be explored; at a more individual level, how personal differences are related to the structuring of social space will be considered.

Berry's model provides clear clues how acculturation strategies are related to the structuring of social space –social integration or segregation–but few systematic attempts have been made to clarify this issue. The interactive acculturation model by Bourhis and colleagues (1997) and other research inspired by their work has resulted in significant advances of our understanding how the specific fit of acculturation strategies is related to the quality of intergroup relations (Barrette, Bourhis, Personnaz & Personnaz, 2004; Bourhis, Barrette, El-Geledi, & Schmidt, 2009; Komisarof, 2009) and variables like perceived threat (Piontkowski, Rohmann & Florack, 2002), perceived discrimination and stress (Jasinskaja-Lahti, Liebkind, Horenczyk, & Schmitz, 2003) and intergroup bias (Zagefka & Brown, 2002).

In general it has been found that if acculturation strategies do not match with each other, as for instance in case the majority wishes minorities to assimilate, but minorities prefer separation, this leads to problematic intergroup relations. It may seem clear that the combination of acculturation strategies thus has an impact on the quality and amount of contact between the groups, but how this is specifically related to the structuring of social societal space in terms such as social integration and segregation has not been clarified.

Using the principles of the simulations reported in chapter 3, a large number of possible social situations will be analyzed in terms of social integration. Specific attention will be devoted to a limited number of scenarios, either because they display outcomes that are produced by a whole range of societal conditions and thus provide a form of summary, or because they are specific or unexpected, and are therefore of special interest.

Overall, because the dynamical model of multicultural integration makes use of continuous dimensions, it is possible to select different attitude strengths and vary these systematically to observe how social integration takes place under different societal conditions. This in the end should result in a fine-grained picture of how acculturation attitudes relate to social integration, in a way that can hardly be achieved with Berry's or Bourhis' models.

A relatively large number of conditions will be analyzed and summarized in graphs. However, in order to clarify specific scenarios, a limited number of pictures of simulation end-states will be provided and explained as well. Focus will especially lie on acculturation situations that are most prevalent in countries that deal with relatively recent large-scale immigration, as this reflects a main focus of acculturation research today.

First simulation study, with uniform groups

Methods

The simulations were conducted on a square grid consisting of 50 rows and columns, resulting in a total number of 2500 cells. Twenty-five percent of the 2500 cells were left open — empty, to provide space for agents to move. There were just two groups, the majority and minority, in the ratio 80/20. Majority outgroup-attitudes and minority ingroup- and outgroup-attitudes were systematically varied using the following values: -0.50, -0.25, 0.00, 0.25, 0.50.

Majority ingroup-attitudes were fixed at 0.50. This resulted in a 5 x 5 x 5 design, with 125 conditions. Each condition was simulated three times. The initial state of all simulations Hypotheses was a random distribution of agents on the grid, an example of which is displayed in Figure 1. Simulations ended after 2000 cycles or rounds of interactions (for a more detailed explanation of the workings of the simulations, please refer to chapter three).

The main dependent variable was social integration between the groups, which was measured by comparing the actual extent of contact between the groups with the extent of contact that would be expected on the basis of randomness. In a perfectly integrated society, culture should not be an issue in interpersonal contacts and thus contacts between the groups should be random when it comes to group membership. Deviations from randomness can then be used to calculate an index for integration. This index has a value of zero in the case of total segregation — no contacts between the groups — and a value of 1 for perfect integration, or a random distribution of contacts.

Several specific scenarios will be analyzed first. Because screenshots of the simulation outcomes will be used to explain the results, these analyses will provide a good and intuitive understanding of how the initial conditions of the simulations relate to the observed outcomes. The combined results of the simulations of all the conditions will be presented at the end, so that the reader's understanding of it is aided by the knowledge of the easier to interpret screenshots of the scenarios presented earlier.

Scenarios of multicultural integration

Segregation

Segregation is typically expected when groups have mutually negative attitudes, but positive ingroup attitudes. Figure 2 depicts the outcome of a simulation in which both groups

favored separation; they had mutually negative attitudes of -0.50 and positive ingroup-attitudes of 0.50. The result is total segregation without any instances of contact between the groups; the level of social integration is zero. What happened during this simulation was that the agents were initially surrounded by random agents of both groups, as displayed in Figure 1. However, when given the chance, they would seek out empty spots in which they would be in contact with as many ingroup members as possible, while at the same time avoiding contact with the other group. After a number of cycles in which all agents had ample opportunities to move, this virtual society took on the shape that is depicted in Figure 2.

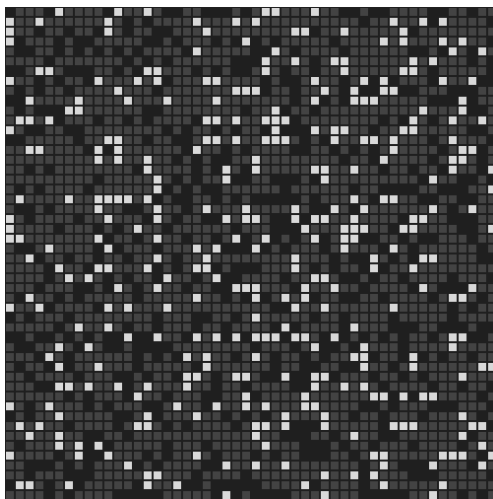


Figure 1
 Initial state of a simulation in which two groups are randomly distributed on a grid. Black color indicates empty space.

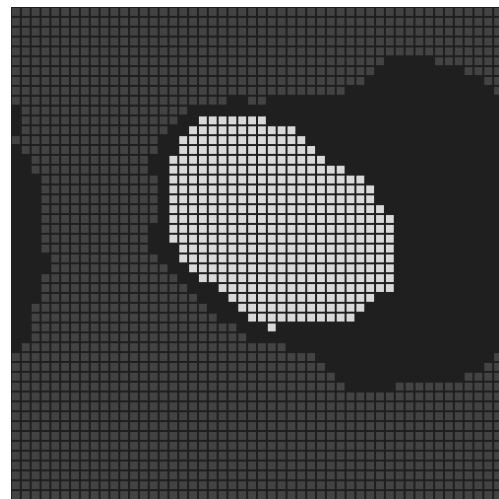


Figure 2
 Simulation outcome based on the situation where both majority and minority outgroup-attitude = -0.50; ingroup-attitude = 0.50. Level of integration = 0.00.

Integration

When people favor integration, an entirely different picture emerges. Figure 3 shows a situation in which both groups have positive ingroup-attitudes 0.50, and also positive outgroup-attitudes 0.50. The result is an integrated pattern in which members of both groups are seemingly randomly distributed. The rate of integration between the group displayed in this figure is 1.35, which indicates a pattern in which contact between the groups occurs even

more often than would be expected on the basis of chance alone. The reason for this is that agents in this simulation tried to make sure to have contacts from both groups, and so especially majority members made an effort to get in contact with a minority member. The underlying mechanism is rooted in the fact that satisfaction is not linearly based on number of contacts, but on the square root of the number. It then is beneficial to give up several contacts of the group of which one has plenty, in order to make one contact of the other group.

In the case when the outgroup-attitudes are not as strong as the ingroup-attitude, but still positive, a quite different pattern can occur. Figure 4 displays a situation in which both groups have the same ingroup-attitudes as in the previous scenario (0.50) but have outgroup-attitudes half as positive as in the previous case; 0.25. The rate of social integration here is 0.59, which is less than half what it was when outgroup attraction was as strong as ingroup attraction.

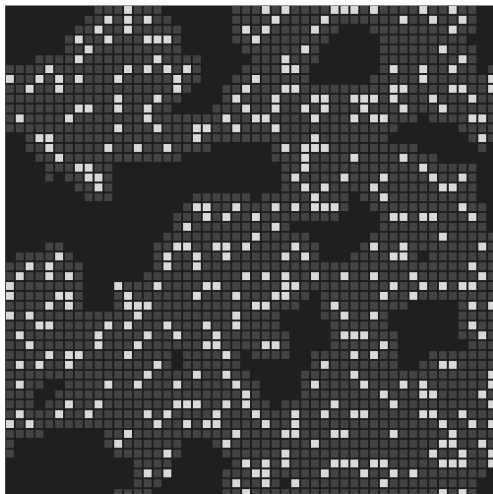


Figure 3
Simulation outcome based on the situation where both majority and minority outgroup-attitude = 0.50; ingroup-attitude = 0.50. Level of integration = 1.35. Majority group is displayed in dark grey color; minority group in light gray. Black indicates empty spaces.

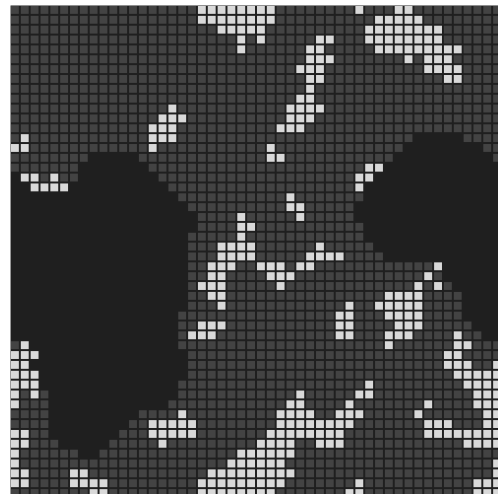


Figure 4
Simulation outcome based on the situation where both majority and minority outgroup-attitude = 0.25; ingroup-attitude = 0.50. Level of integration = 0.59. Majority group is displayed in dark grey color; minority group in light gray. Black indicates empty spaces.

In Figure 4, the minority is clearly much more clustered together than in Figure 3. In relation to the discussion in the previous chapter regarding the uniformity of outcomes for different attitude combinations within the same acculturation strategy, this result shows how the same acculturation strategy –integration– can be related to different outcomes.

Tolerance

In public debates in many countries with a culturally plural population, tolerance is often touted as the key to successful multicultural integration. Tolerance, the acceptance of others who are different although one may not agree with them, can be represented in the dynamical model as having a neutral stance toward the other, or an attitude with value zero. Given the face validity of the claim that tolerance is instrumental in establishing integration, it is surprising that mutually tolerant agents did not integrate as well as expected; they actually did not integrate at all! As can be seen in Figure 5, tolerance resulted in segregation rather than integration. The measure of the rate of social integration between the groups for Figure 5 only values 0.03, which nearly equals total segregation.

A closely related situation, which may reflect current circumstances in some countries, is where the majority group is tolerant towards the minority, and the minority is moderately positive towards the majority (0.25), while both are positive about their own group (0.50). The outcome of the simulation of this situation is depicted in Figure 6. In this case, minority members were motivated to engage in contact with an indifferent majority and made efforts to establish social relationships. However, the outcomes again are not very promising. Although large contact zones have formed between the groups, they are still largely segregated. The measure of social integration is 0.22, which is decidedly different from zero, but far from any serious level of integration.

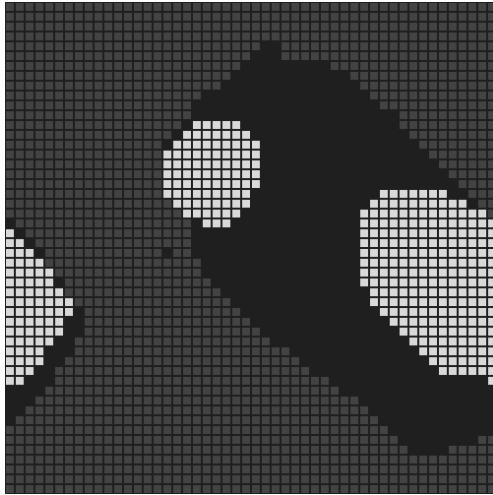


Figure 5
Simulation outcome based on the situation where both majority and minority outgroup-attitude = 0.00; ingroup-attitude = 0.50. Level of integration = 0.03. Majority group is displayed in dark grey color; minority group in light gray. Black indicates empty spaces.

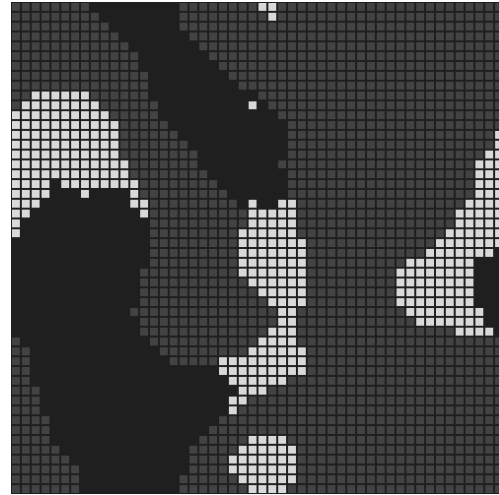


Figure 6
Simulation outcome based on the situation where outgroup-attitudes are 0.00 for the majority, 0.25 for the minority; ingroup-attitudes = 0.50. Level of integration = 0.22. Majority group is displayed in dark grey color; minority group in light gray. Black indicates empty spaces.

Opposite contact wishes

Scenarios that are characterized by a positive attitude of one group towards the other that is reciprocated by a negative attitude by the other group, lead to a peculiar situation. The group with positive outgroup-attitudes will approach the other for contact. Members from the other group, having negative attitudes, react to this by withdrawing from these interactions. What emerges is a pattern that could be characterized as hide-and-seek, in which members of one group are constantly in pursuit of those of the other. It does not matter which group has the positive and which the negative attitude. In simulations, this pattern is a perpetual dynamic that never stabilizes. Although seemingly unlikely at first sight, real life counterparts do exist. The phenomenon of neighborhood tipping –the relatively sudden turning over of the ethnic make-up of a predominantly homogeneous neighborhood has received considerable attention in simulation studies (Anas, 1980; Schelling, 1972; Zhang, 2011). But empirical studies have also described how residential neighborhoods change when previous inhabitants

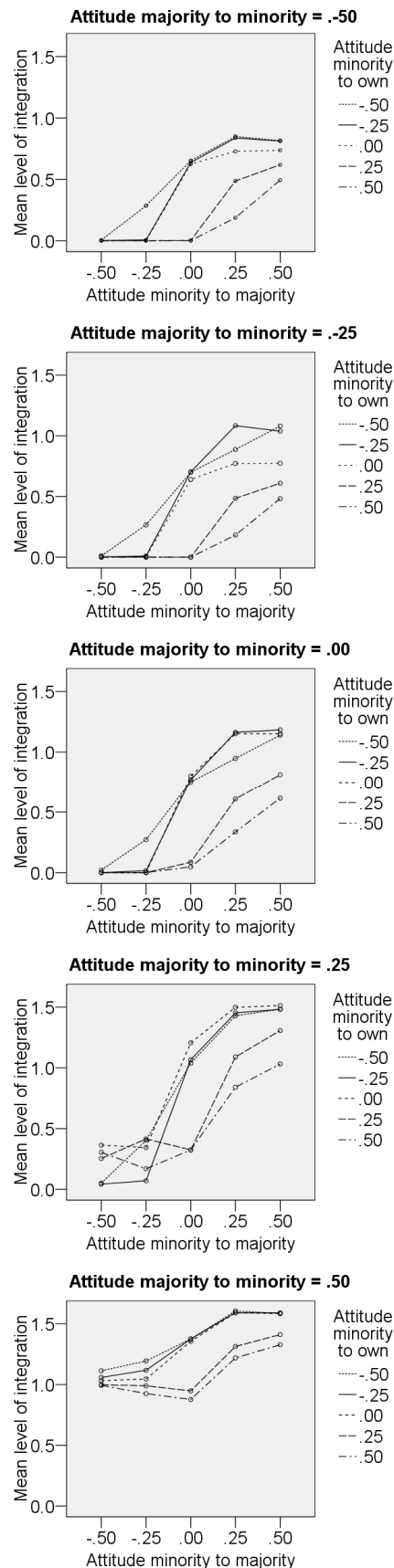


Figure 7. Relation between acculturation attitudes and social integration for 125 scenarios

start to move out once newcomers with a different ethnicity arrive in sufficient numbers (Card, Mas & Rothstein, 2008; Clark, 1991; Denton & Massey, 1991), providing support for the earlier simulation findings and for the results in the current scenario. In addition, similar phenomena have been documented in other areas, such as schooling (Caetano & Maheshri, 2001; Clotfelter, 1976).

Overview of results of all simulated conditions

It would take up far too much space to analyze each condition individually in the way it was done above, and it would also have the disadvantage that overall patterns may become obscured. Figure 7 summarizes how the 125 conditions are related to social integration, and allows us to abstract generalities from these situations. The combinations of minority attitudes are displayed in each graph; the different values of the majority attitude towards the majority are displayed in different graphs.

What can be observed is that integration rates are highest when the minority attitude towards the majority is more positive than their attitudes towards their own group, especially in case the ingroup-attitude is non-positive –the assimilation

acculturation strategy. This is true overall; the highest levels of integration are obtained under these circumstances, but it is also true for each specific value of the minority attitude towards the majority¹. The second condition under which relatively high levels of integration are obtained, though markedly lower, is in case both minority attitudes are positive –the integration acculturation strategy. The separation strategy, characterized by positive ingroup-attitudes and non-positive attitudes towards the majority overall leads to very low levels of integration.

As long as the attitude of the majority towards the minority is not positive, the patterns of relations are characterized generally by little contact between the groups. Things change with positive majority outgroup attitudes, however. With an outgroup-attitude of 0.25, nearly all levels of integration go up a bit, and even most of the scenarios previously characterized by total segregation now see some low levels of integration. When the majority outgroup-attitude reaches the same level as its ingroup-attitude, 0.50, things change entirely: Suddenly the lowest levels of integration approach 1.00.

Discussion

These simulations have helped to clarify the relationship between acculturation attitudes and multicultural integration. By using homogeneous groups it was possible to isolate the specific effects connected to different values of the attitudes. For some attitude values, the outcomes were rather obvious, for example that mutual negativity leads to segregation and mutual positivity to integration; but for other values the results were not so intuitive. Tolerance for instance seems to lead to segregation rather than integration, and even a mildly positive attitude of the minority, in combination with a tolerant majority, is not sufficient to ensure serious levels of integration.

¹ The case in which both minority attitudes are zero should be disregarded. When both attitudes are precisely zero, satisfaction will always be zero and so this attitude combination leads to total apathy. This anomaly is an unintended side effect of the formulation of the model.

These simulations provided a way to analyze types of possible behaviors and resulting social integration and intergroup relations that would have been difficult to achieve on the basis of deduction alone. The next series of simulations, however, will go an important step further. Groups are not homogeneous entities, and it is unlikely that any model will be able to provide a complete or even sufficient understanding of multicultural integration if individual differences are not taken into account. People have different beliefs and attitudes and act accordingly.

Groups may to some extent be understood based on averages of important variables, but it is beyond doubt that in group and intergroup dynamics relatively small numbers of individuals sometimes have a large influence. An interesting question then concerns if simulation outcomes would change if people had different attitudes even if the group average would remain the same. Does the level of intergroup contact change if there is more variation in people's attitudes? What are the consequences for the patterns of contact that emerge in social space? These important questions have not been answered clearly so far, because existing models like the ones of Berry and Bourhis were not conceived with the aim to answer them.

Second simulation study, with heterogeneous groups

Methods

In order to most accurately observe how the introduction of individual differences affects the simulation outcomes, this series of simulations will use the same design as the previous series, with only individual variations in attitudes added. So, minority attitudes and the majority attitude towards the majority were assigned using the same mean values as in the

previous simulations (-0.5, -0.25, 0, 0.25, 0.5). As before, the majority will be assumed to hold positive ingroup attitudes of 0.50.

Individual differences were created according to a normal distribution with a standard deviation of 0.35. This value provides sufficient variation, but ensures that the overlap of the distributions around the different mean values in the different conditions is not too large, so that they remain distinct. Because the model limits attitude values to the -1 to +1 range, however, assigned attitudes that lied beyond these boundaries were set to -1 or 1 respectively (or 1 and 0 in case of majority ingroup-attitudes), which resulted in slightly smaller standard deviations than 0.35. Each of the $5 \times 5 \times 5 = 125$ conditions was simulated three times, resulting in 375 simulations. To make the comparison of the results as systematic as possible to the previous simulations series the same order of presentation will be followed.

Scenarios of multicultural integration

Segregation

Figure 8 shows the segregation scenario that was also displayed in Figure 2. Ingroup-attitudes are 0.5, outgroup-attitudes -0.5. Because the attitudes are no longer uniform, a dual picture is presented, in which the panels display ingroup- and outgroup-attitudes separately. Not surprisingly, both groups are segregated, but there are marked differences with the situation portrayed in Figure 2, where there was not a single contact between members of different groups. There are four important differences to note between the current and the earlier scenario.

First, segregation is not complete. Some minority members are embedded in the majority group. Inspection of the figures shows that in this example they mainly have both positive outgroup- and ingroup-attitudes. The evolution of the simulations in time cannot be

displayed here, but visual analysis of many ongoing simulations demonstrated that a limited number of these “islands” were always present. Individually they are not stable, as sometimes individuals move by chance alone, but as a phenomenon it is a constant. What can also be observed is that they are mainly surrounded by majority members with positive outgroup-attitudes. The reason that no embedded outgroup members exist within the minority is that the absolute number of minority members with a positive outgroup-attitude is so small that this configuration is highly unlikely to happen, and if happens that it is very unstable. We do observe majority members at the fringes of the minority group though.

Second, the groups at large are in contact by “social bridges”. Extensions of both groups that connect are formed by agents with mutually positive attitudes, who on the back side are connected to agents of their groups who have negative outgroup-attitudes. These bridges are not stable in the long run, but they appear and disappear over time. Their appearance however seems to be negatively related to the number of minority members who are embedded within the majority. The likely reason is that because the number of minority members with positive outgroup-attitudes is limited, the chance for a bridge decreases if many agents capable of building bridges are embedded in the other group. Because of the sporadic contact between the groups, the rate of integration between the groups increased from 0.00 in Figure 2 to 0.04 in the current figure.

Third, there are loners among the minority members. Because of random variation, a number of minority members ended up with both negative attitudes towards their own group and the majority. As a result, they shun contact and place themselves outside of either group.

Fourth, individualism leads to dynamism. The situation in Figure 2 was stable, only sometimes interrupted by randomly induced movements. The situation in Figure 8 is dynamic. Although the groups have clustered, their shape is not static and is in constant flux.

Agents with positive outgroup-attitudes continuously approach members of the other group, who most often withdraw.

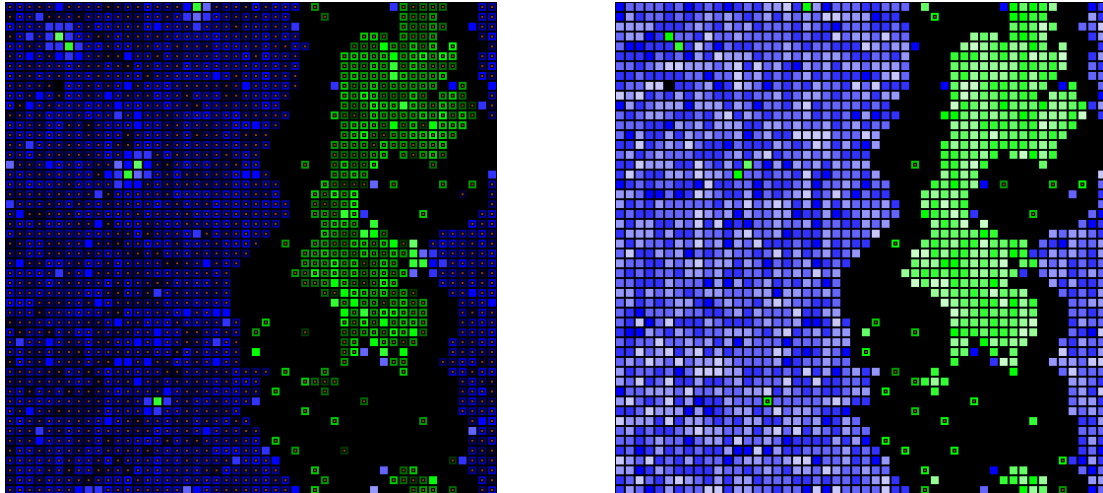


Figure 8

Simulation outcomes based on the situation where the mean of both majority and minority out-group attitude = -0.50; in-group attitude = 0.50. The standard deviation of all attitudes was set at 0.35. Outgroup-attitudes are shown on the left side, ingroup-attitudes on the right side. Level of integration is 0.04. Majority group is displayed in blue color; minority group in green. Black indicates empty spaces. The tone of the color indicates the strength of the attitudes: lighter colors indicate more positive attitudes, darker colors more negative ones. Agents with negative attitude have a small red dot in their center; agents with positive attitudes are uniformly colored.

Integration

The integration scenario of Figure 3 is repeated in Figure 9: All attitudes on average are 0.50. The pattern is quite similar, though a little less random. In the left panel of Figure 9 it is noticeable that agents with negative outgroup-attitudes have clustered together to some extent. The level of integration here is 1.22, which is lower than in Figure 3, but still substantially higher than the level of integration expected on the basis of chance. As in the previous comparison, this scenario was also more dynamic than its homogeneous counterpart. Dynamism in this case was driven by minority agents with negative outgroup-attitudes, trying to avoid contact with approaching majority members. Because of being in the minority, these agents had no place to “hide” from majority members among other minority members,

because these other minority members had positive outgroup-attitudes and intermingled with the majority.

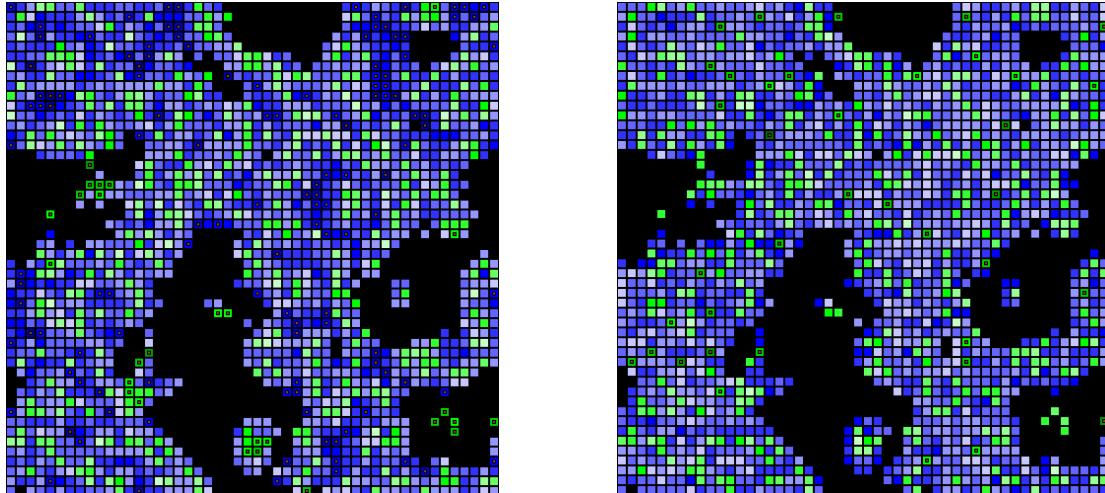


Figure 9

Simulation outcome based on the situation where both majority and minority out-group attitude = 0.50; in-group attitude = 0.50. The standard deviation of all attitudes was set at 0.35. Outgroup-attitudes are shown on the left side, ingroup-attitudes on the right side. Level of integration is 1.22. Majority group is displayed in blue color; minority group in green. Black indicates empty spaces. The tone of the color indicates the strength of the attitudes: lighter colors indicate more positive attitudes, darker colors more negative ones. Agents with negative attitude have a small red dot in their center; agents with positive attitudes are uniformly colored.

The weaker variant of integration (0.50 ingroup-attitudes, 0.25 outgroup-attitudes) resulted in the patterns displayed in Figure 10. The mixing of the groups is here much stronger than in the comparable scenario of Figure 4: 0.95 compared to 0.59. The pattern is actually not that different from the one in Figure 9, although the clustering of agents with negative outgroup-attitudes is more pronounced. Also this scenario proved to be a little more dynamic than the previous one, which can be explained by the larger number of agents with negative outgroup-attitudes.

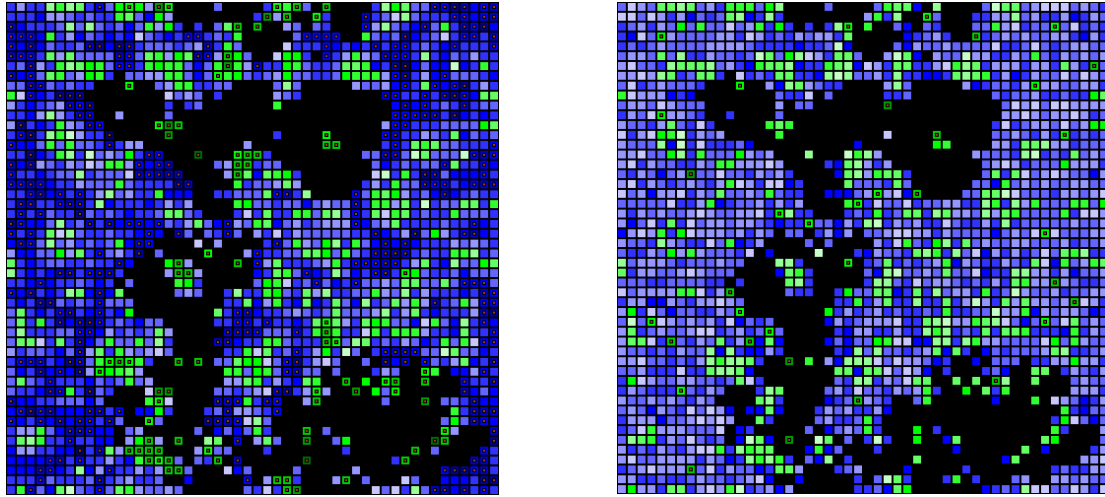


Figure 10

Simulation outcome based on the situation where both majority and minority out-group attitude = 0.25; in-group attitude = 0.50. The standard deviation of all attitudes was set at 0.35. Outgroup-attitudes are shown on the left side, ingroup-attitudes on the right side. Level of integration is 0.95. Majority group is displayed in blue color; minority group in green. Black indicates empty spaces. The tone of the color indicates the strength of the attitudes: lighter colors indicate more positive attitudes, darker colors more negative ones. Agents with negative attitude have a small red dot in their center; agents with positive attitudes are uniformly colored.

Tolerance

The two variants of the scenarios involving tolerance are displayed in Figures 11 and 12. The panels showing the ingroup-attitudes were left out for these scenarios, because they are less informative. Again these figures are very different from their counterparts that included no individual differences. The previous scenario in which the groups were mutually tolerant resulted in near total segregation, whereas in the present case integration is as high as 0.53. The comparison between the related scenarios in which the majority group is tolerant towards the minority and the minority mildly positive towards the minority leads to similar results. Again the scenario that included individual differences is connected to a much higher level of integration, 0.74 compared to 0.22. Also these scenarios portrayed higher ongoing dynamics than the scenarios of Figures 5 and 6.

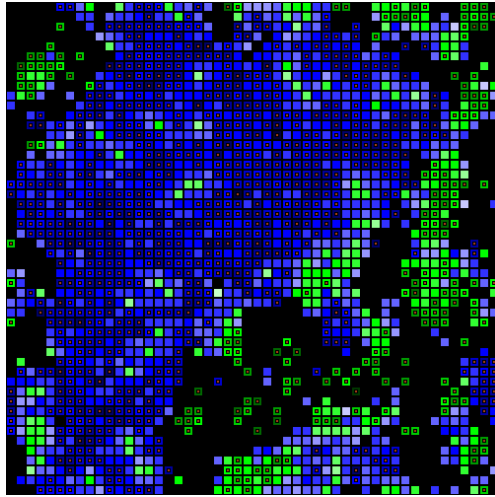


Figure 11

Simulation outcome based on the situation where both majority and minority out-group attitude = 0.00; in-group attitude = 0.50. Level of integration is 0.53. The majority group is displayed in blue color; the minority group in green. Black indicates empty spaces. The tone of the color indicates the strength of the attitudes: lighter colors indicate more positive attitudes, darker colors more negative ones. Agents with negative attitude have a small red dot in their center; agents with positive attitudes are uniformly colored.

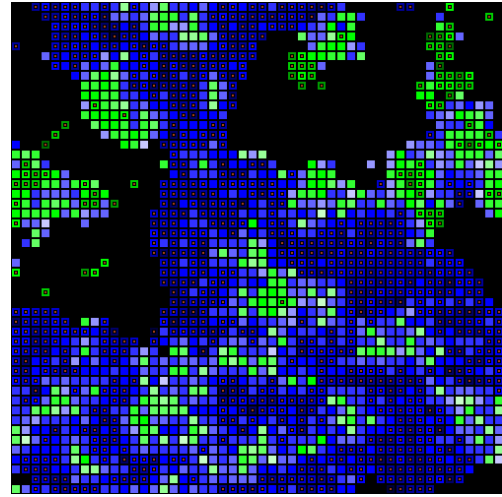


Figure 12

Simulation outcome based on the situation where out-group attitudes are 0.00 for the majority, 0.25 for the minority; in-group attitudes = 0.50. Level of integration is 0.74. The majority group is displayed in blue color; the minority group in green. Black indicates empty spaces. The tone of the color indicates the strength of the attitudes: lighter colors indicate more positive attitudes, darker colors more negative ones. Agents with negative attitude have a small red dot in their center; agents with positive attitudes are uniformly colored.

Opposite contact wishes

In case the minority would like intergroup contact and the majority doesn't, a similar pattern of hide and seek emerges as in the previous series of simulations. The pattern is a little less dynamic though, and when the strengths of the opposing attitudes become smaller, the dynamics decreases.

Overview of results of all simulated conditions

An overview of how social integration is related to the average attitudes in all the 125 scenarios that included individual differences is provided in Figure 13. What is most striking

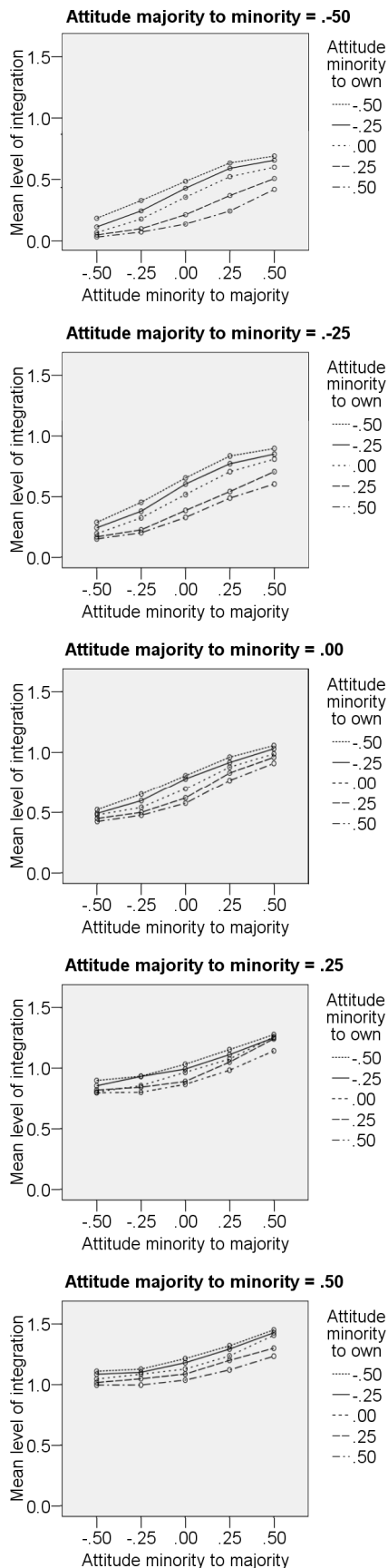


Figure 13. Relation between average acculturation attitudes (sd 0.35) and social integration for 125 scenarios

in this graph is that the relationship between the attitude averages and social integration is near-linear and that the lines are mainly parallel. In the previous, homogeneous scenarios the rate of social integration was much more dependent on the *specific* combination of attitudes, which can be concluded from the sometimes sudden jumps in social integration values when the value of one variable was increased by only one step, while keeping other variable constant, e.g. when majority outgroup-attitudes increased from 0.25 to 0.50.

Several of the visually presented scenarios with individual differences had higher levels of social integration than did the same scenarios with homogeneous groups. A comparison of all 125 scenarios with and without variation in attitudes shows that in the no-variation conditions the average level of integration was 0.65, and in the scenarios with variation 0.75. Adding variation to the attitudes thus leads overall to higher levels of social integration between the groups.

Clustering of agents of the same group according to their outgroup-attitudes was clearly observed in the figures of some scenarios. This is remarkable because this attitude is not at all causally related to contact with ingroup members. In order to obtain a more reliable measure of this phenomenon, the correlation for each scenario was

calculated between each agent's outgroup-attitude and those of same-group neighbors. It turned out that for the majority this correlation measured 0.27, and 0.26 for the minority. These correlations are an average, and are therefore significantly higher in some scenarios, like the one shown in Figures 11 and 12, and lower in others.

Of the simulation series presented so far, the scenarios presented here most closely resemble real life. Therefore this is a suitable moment to compare the relative importance of the variables in the model in order to see what mainly drives multicultural integration. The question of relative importance of the variables is difficult to answer on the basis of the inspection of Figure 13, however, and thus a quantitative measure of effect size, omega-squared was calculated. (See chapter 3 for a detailed discussion regarding the use and calculation of statistical indicators and omega-squared values for analyzing simulation outcomes.) The effect sizes were calculated on the basis of a univariate analysis of variance of the current simulations, with social integration as dependent variable and majority outgroup-attitude and minority outgroup- and ingroup-attitudes as independent variables.

The result of this analysis is summarized in Table 1 and reveals that the majority attitude towards the minority is by far the most influential variable in this model. The size of the effect of the majority measures 0.690 which is three times as large as the second most important variable, the minority's attitude towards the majority. The third most influential variable is the minority's attitude towards their own group, with an effect size of only 0.047. The effect sizes of all interaction are several factors smaller again and reach a level at which they are practically insignificant. The overall picture that emerges is one of linear main effects, without interactions and an overwhelmingly large influence of the majority group on multicultural integration.

Table 1

Effect sizes for the influences on social integration of all main effects of ingroup- and outgroup-attitudes of the minority and outgroup-attitudes of the majority and all the interactions between these variables

Term	ω^2
Attitude majority to minority	0.690
Attitude minority to majority	0.235
Attitude minority to own group	0.047
Interaction attitudes majority to minority and minority to majority	0.014
Interaction attitudes majority to minority and minority to own group	0.006
Interaction attitudes minority to majority and minority to own group	0.004
Interaction of all three attitudes	0.002
$\Sigma = 0.998$	

Discussion

The inclusion of individual differences in the model had a profound impact on the simulation outcomes. Many scenarios with the same mean attitude values as in the previous series of simulations showed different patterns of social relations between and within groups. Sometimes these differences were small, as in the case of the segregation scenarios, where the levels of social integration were comparable for the simulations with and without individual difference. In other instances, the differences between scenarios were large, as in case of the tolerance scenarios, for instance. Overall it was observed that the levels of social integration were higher when individual differences were taken into account.

Before analyzing, discussing and comparing the overall outcomes observed in this series of simulations, it would be good to look at some specific examples that exemplify how fundamentally important it is to take individual differences into account. Simulation of the segregation scenario –which is characterized by mutually negative attitudes– in the first series resulted in a state of complete segregation; a level of integration of 0.00. The same scenario displayed a level of integration of 0.04 when individual differences were included. This

difference is numerically very small, and seems insignificant. There is good reason to believe, however, that this very small difference can be tremendously important in reality; that it may indicate the difference between a situation that could result in large-scale violence and brutality, versus one in which this threat can be successfully contained (de Raad, Nowak & Borkowski; 2013).

Situations characterized by mutually negative attitudes and lack of contact between groups have repeatedly been linked to prejudice, conflict and sometimes violence (Doherty & Poole, 1997; Healy, 2006; Pauly, 2004; Varshney, 2001; White, 1998). The absence of contact between groups can go hand in hand with mutual suspicion and ignorance (Gallagher, 1995), which in combination with certain group dynamics can propel a situation towards escalation. Varshney (2001) in detail shows how the absence of contact and communication is related to violent conflict between Hindus and Muslims in India, but he also shows how cross-cutting ties between the groups in some places were instrumental in containing violent outbursts. Similar conclusions can be drawn on the basis of an analysis of several communities in Northern Ireland, where intergroup contact is related to conflict prevention and control (Darby, 1986).

The complete segregation of groups is pathological because without any contact, mechanisms of mediation and feedback no longer exist that could have been able to bring the groups together in order to pacify the situation. Seen in this light, people with a positive attitude towards both groups may be crucial in preventing the escalation of a situation, even if their numbers are very small. A good understanding of a situation is thus unlikely to result from looking at mean attitude values, or looking at groups as relatively homogeneous entities.

A second example may clarify this point further. In some scenarios, such as those of segregation and tolerance, agents could be observed that had neither contact with their own, nor the other group, who in other words chose what has been termed marginalization. The

marginalization acculturation strategy has been linked to negative and problematic adaptation outcomes (Berry, 1997; Berry et al., 2006). It is connected to delinquent behavior (Emler & Reicher, 2005), street gang membership (van Gemert, Peterson & Lien, 2008) and radicalization and extremism (Post, 2005; Sageman, 2004; Smelser, 2007). In fact, the large-scale riots in France in 2005 have been directly linked to social alienation and exclusion (Haddad & Balz, 2006; Koff & Duprez, 2009).

Of course, the number of immigrants “preferring” marginalization is small, but because of the reasons listed above their negative impact on society and intergroup relations and the amount of attention they attract is disproportionally large. So here again, awareness of a relatively small number of people should result in a very different appraisal of a situation, as compared to when only general group characteristics would be used.

The level of social integration for the segregation scenario discussed above was only a little higher for the simulation with individual differences. Averaged over all the simulations however, the levels of social integration increased from 0.65 to 0.75 when individual variation in attitudes was added to the scenarios. The reason is that with distributed attitude values agents no longer behave in an identical fashion, as each agent acts in accordance with its own attitudes. This means that if the mean outgroup attitude increases for example, more agents will have a positive outgroup attitude and will want to contact outgroup members. As a consequence, levels of integration start rising immediately as the average outgroup attitude increases.

With homogeneous groups by contrast, the resulting level of social integration depended on the precise combination of attitude values. Simulation outcomes could be relatively uniform (and low) until one attitude crossed some sort of threshold after which a sudden jump in social integration was observed. This is for instance the case when the

majority outgroup-attitude was increased from 0.25 to 0.50. Levels of integration would continue to stay low until a certain point was reached, whereas in the case of individual differences, the level of integration rises immediately as the mean attitude value increases. Overall these immediate increases result in higher levels of social integration.

Because individual differences smooth out the previously observed outcomes produced by homogenous groups, which sometimes displayed abrupt changes as a result of relatively small differences in simulation starting conditions, the relationship between the attitudes and social integration becomes linear, and much easier to interpret. The effect size calculations confirmed that it is now sufficient to look at the main effects of the attitudes to understand the level of social integration, because the interactions between the variables were nearly zero. This makes it possible to directly compare the relative importance of the different variables. It turned out that the majority's influence on social integration is much larger than that of the minority. This outcome has considerable relevance to ongoing public and academic discussions.

In the field of acculturation research it is remarkable that the topic of majority acculturation has received very little attention. Conceptually, the role of the majority has been acknowledged in some respects (e.g. Berry, 1997, 2003; Bourhis et al., 1997; Horenczyk, 1997; Kagitcibasi, 1997) but this is not reflected much in actual research. The heavy emphasis on minority acculturation and adaptation has also led to criticism from within the field (Dinh & Bond, 2008; Rudmin, 2003). It does not seem plausible to assume that this imbalance of interest reflects a general opinion in academia that minorities are primarily responsible for successful socio-economic integration. However, it does signify that in acculturation research there is a lack of sensitivity to the interplay between the acculturating groups, and the specific role the majority group plays in social integration and its impact on minority acculturation.

In public debates the belief in a large minority responsibility for adaptation and integration does exist; it is often stressed that minorities have to make an effort to adapt to the majority (culture) and that if socio-cultural integration is not evolving according to expectations (of the majority), this is a sign that minorities are not making sufficient effort, or that they lack motivation. This seems to rest on the assumption that minorities hold the key to shaping the multicultural society in a satisfactory way. This popular notion that by making an effort, minorities hold the key to a socially well-integrated multicultural society, is contradicted by these simulations.

Great care should be taken when drawing conclusions about real life on the basis of simulations, especially if it concerns a sensitive topic such as this one. First of all, these simulations are a gross oversimplification of reality. Societal circumstances were not taken into account nor were the cultures of the interacting groups. Second, the results of these simulations are based on a large number of societal states, e.g. different combinations of mean attitudes towards own and other, which makes it possible to draw general conclusions, but makes it difficult to draw conclusions that apply to any specific society.

That being said, there is ample reason to believe that majority influence on multicultural integration is indeed very large. Successful multicultural integration means that minorities are successfully participating socially, economically, culturally, politically, etc., in the society at large. By and large, however, minorities have relatively low social and economic status, low levels of education and are low in political participation, not well represented and not well organized. They are in a disadvantaged position, and this is a barrier to successful integration. Multicultural integration is thus about change towards greater participation in the society.

The ease with which one can enter the society will thus have a major impact on the number of people being able to do so successfully. For a minority, social integration means

establishing and maintaining contact with people from the majority. If the majority is generally open, supportive of cultural differences and low in prejudice, there should be few obstacles to making intergroup contacts and friendships for those minorities who want to. It is clear that this would be very different in a rather xenophobic society. Decades of research on the contact hypothesis has shown that prejudice is related to decreased levels of contact (Pettigrew & Tropp, 2006). In addition, feelings of anxiety and threat, both of which relate to a hostile climate, exacerbate this relationship (Dijker, 1987; Florack, et al., 2003; Islam & Hewstone, 1993; Stephan & Stephan, 1985; Stephan, Stephan & Gudykunst, 2002).

Experiences of prejudice, negative attitudes and especially discrimination and racism will of course leave their mark. Acculturation strategies are not static and change over time in response to environmental circumstances (Berry, 1997). If attempts of approach and making contact are met with negative reactions this will undoubtedly lower the willingness and probability to do so again in the future. A decreasing attitude towards the majority does not have to lead to an increase in attitude towards the own group and towards cultural maintenance, but it is not hard to imagine that if the majority is unwilling, a shift in orientation towards the own group can happen. Such mechanisms in the long run cause a minority to become more separated from the larger society. When this happens it may be interpreted as proof of bad will on behalf of minorities and used as an argument against multicultural policies. What is easily overlooked is that minorities in fact might not have wished to live in this way, but that it is simply the outcome of the circumstances in which they found themselves. It has in fact been shown that, overwhelmingly, minorities prefer to integrate, and not segregate (Berry, 1997).

Multicultural integration is not limited to social integration, but also involves social mobility (Blau, 1956; Gans, 1992; Rogler, 1994), which is more closely related to education, economic success and politics. Educational performance of minorities, for instance, is

hampered by discrimination and prejudice (Hurtado, 2004; Hurtado & Carter, 1997; Kao & Thompson, 2003; Ogbu, 1978, 1990) and is thus directly influenced by the majority's attitudes towards minorities. Lower educational achievement in turn is a limiting factor on the type of jobs and careers that can be accessed, which in turn influences economic success. In addition to impaired educational performance, minorities suffer under the negative majority attitude again when looking for work or starting a business as most of the positions involving decision power will be held by majority members. All in all, a negative majority makes it tremendously more difficult for disadvantaged minorities to move up on the social ladder and fully integrate into the society at large.

The inevitable outcome of such processes is that minorities become –to some extent– segregated, or remain so. Sociological research has provided ample proof of the interrelatedness of factors such as prejudice (Bobo & Zubrinsky, 1996), socio-economic status (McAdams, 1995; Williams, 2006), education (Orfield & Lee, 2005; Rumberger & Palardy, 2005), the rule of law (Cole, 2003; Steffensmeier & Demuth, 2000), and their relation to segregation and integration in general (Charles, 2003; Feagin, 1991; Pager & Shepherd, 2008; Sidanius & Pratto, 1999; Yinger, 1995). It is beyond doubt therefore that the majority group, although often not responsible for minorities being disadvantaged at the outset, has a very large impact on the trajectory of multicultural integration. Once minorities become segregated because of being disadvantaged in combination with an unwilling, unwelcoming majority, it is unrealistic to think that the situation could change by the efforts of the minority alone. Ironically, the more negative the majority towards the minority, the more emphasis seems to be placed on minority responsibility for integration, and the more they are blamed for being segregated. To change such social patterns once they are formed is likely to be very difficult.

One of the few institutions, if not the only one, that would be able to influence the course of such societal patterns is the government. Government policy can promote social integration and social mobility or can obstruct it (Bourhis et al., 1997; Parekh, 2000). But here again, the majority's influence will be larger. This is in part related simply to the majority's numerical superiority, which translates to votes and political influence. But it is also related to majority dominance in defining public opinion and the general social climate in which political debates take place, decisions are made, and importantly, in which policies have to be carried out. Of course governmental policy does not map one-to-one onto the majority's acculturation attitudes. It seems plausible though that there is a relatively strong relationship between public opinion on a topic as important as multiculturalism and immigration and official government policy, at least in democratic societies.

The discussion above is suggestive of several kinds of governmental/social policies that could aid multicultural integration based on classic notions such as education and work. One remarkable outcome of the last series of simulations provides yet another perspective on such measures, complementary to the known perspectives of social mobility and equal opportunities.

This perspective is related to the surprising observation that in many simulations outgroup attitudes of adjacent agents of the same group became correlated. By itself it is not surprising that people with similar ideas cluster together, as it is a well known fact that similar attitudes attract (Byrne, 1961; Byrne, Gouaux, Griffitt, Lamberth, et al., 1971; Condon & Crano, 1988). What is surprising though is that such an attraction mechanism was not present in these simulations, and that this structuring of social contacts is thus an emergent property of the model. This result shows that attraction to like-minded others is not a necessary condition for clustering to happen according to outgroup attitude.

What happens instead is that agents with positive outgroup-attitudes who look for contact with the other group, or at least not avoid it, will generally end up in places where intergroup contact is possible, which is at the boundaries of clusters. Agents with negative outgroup attitudes on the other hand seek contact with ingroup members exclusively, and will generally try to stay clear of locations close to the other group and thus prefer the center of clusters where there is nearly no potential for contact with the outgroup. As outgroup attitude determines who prefers to be in the middle of clusters and who at the fringes, it provides a sufficient explanation why ingroup clustering according to outgroup attitude happens.

It is an interesting question whether such a “layered” ordering of social space actually exists. In the context of acculturation there seem to be no studies to date that can answer it unfortunately. Based on the generally substantiated notion that “birds of a feather flock together” (McPherson, Smith-Lovin & Cook, 2001) we may expect this to be the case however. This notion then may have some significance in the light of possible attempts to promote social integration.

Practically, it might be difficult to reach out to those who are in the center of social clusters characterized by a negative outgroup-attitude, because the social distance to the other group is relatively large, and the social context will exert considerable influence opposing attempts to improve outgroup-attitudes. For minorities, group clustering in general has been linked to lower levels of (opportunities for) intergroup contact (Gijssberts & Dagevos, 2007; Semyonov & Glikman, 2009; van der Laan Bouma-Doff, 2007). For the majority increased homogeneity of the population has been related to reduced opportunities for contact with minorities and to increased levels of prejudice, crimes and violence against minorities (Wagner, van Dick, Pettigrew & Christ, 2003). Although these studies focus primarily on spatial concentration and the dynamical model of multicultural integration is dealing with social space, both are known to be closely related (Feldman & Tilly, 1960; Latané & Liu,

1996; Latané, Liu, Nowak, Bonevento & Zheng, 1995) and it thus is reasonable to assume that a correlation between concentration in physical and social space exists.

One way to go in order to increase intergroup contact for minorities would be to try to limit the social distance to the majority group by preventing social clusters becoming too large. This would have the effect of making it more likely that relatively segregated individuals enter in contact with members of the other group. With people holding negative outgroup-attitudes, this contact might be instrumental in improving these attitudes. Figure 8 however shows that the large minority cluster includes agents who have positive outgroup attitudes in addition to the all those who have negative outgroup attitudes. Because of being embedded in a large cluster, however, they do not have any outgroup contacts. If the cluster were smaller and the likelihood for intergroup contact bigger, these individuals would be much more likely to engage in contact with and even integrate to some extent into the majority group.

Even if people continue to eschew contact with the other group, with decreased social distance between clusters it is more likely that they are in contact with same-group members who do have outgroup contacts. In that way, they will indirectly have access to more and more accurate information about the other group, which should decrease feelings of threat and in turn prejudice (Quillian, 1995; Stephan & Stephan, 2000). Research on the extended contact hypothesis has illustrated that prejudice is indeed reduced by having contact with ingroup members who have outgroup friends (Liebkind & McAlister, 1999; Turner, Hewstone, Voci & Vonofakou, 2008; Wright et al., 1997).

By the same token, for the majority group it would also make sense to reduce the social distance to minorities. Because the majority group by definition is much larger than the minority, this would be achieved when minorities were dispersed between majority members as evenly as possible. This may involve spatial dispersion of minorities, but more importantly

dispersion in social space. This means that it is important that minorities are well represented in typical places where a lot of social contacts take place, such as institutions of education, work, business, governance, leisure, and so on. Because minorities often are of lower status and in disadvantaged positions, they tend to be overrepresented in some places, and underrepresented in others. This clearly is not conducive to social integration. It is beneficial therefore to actively support minorities to provide opportunities so that they can enter into areas where they are underrepresented, as this promotes dispersion. Important examples include education, work and living.

Stimulation of minorities to complete the higher levels of education in which they are often underrepresented is important for dispersion. Complementarily, the prevention of “black” schools is important to prevent clustering in social space. The issue of work is of course related to education, but in addition anti-discrimination policies may help minorities access the job-market better, as would a minimum quota of minority employees in government institutions for instance. Clustering is often also manifested physically in neighborhoods. This is driven by socio-economic factors and the price of housing and difficult to counter. Good access to work and schooling may help minorities to leave such neighborhoods, but may not reduce clustering if new minorities subsequently move in. Two possible measures are to influence the make up of the neighborhood or to limit its size. Once clustering has taken place and a “black/colored/racial” neighborhood has been formed, it may help to encourage students or others looking for relatively cheap housing to move in by subsidizing rent for instance. Neighborhood size can be manipulated by making changes to infrastructure by separating areas physically or socially.

It is clear that the types of measures proposed to decrease social distance and cluster size on the one hand, and measures aiming to improve minorities’ positions and social mobility on the other hand, overlap to a large extent. The conceptual approach leading to

these measures is different however. The social distance approach stresses the need for bringing people closer together socially. Most measures aimed at improving a minority's position will also help them integrate socially, and this explains the overlap. Other measures will help social integration without being directly relevant socio-economically, however, as in the case of the measures proposing limits on neighborhood size/clustering.

This discussion has shown that the dynamical approach enhances the resolution of our picture of multicultural integration by making it possible to focus on particular scenarios and zoom in on specific individuals within them. A major limitation of the model however is that within it agents' attitudes do not change as a consequence of their experiences. Any comprehensive model of acculturation should not only indicate how acculturation attitudes influence people's preferences and behaviors, but should also specify how these attitudes are formed and change over time. Naturally, the relationship between the variables in such cases is reciprocal, which makes it difficult to establish the direction and strength of causality. It would not have been surprising therefore if progress on this issue had been slow. However, it is surprising that there has been virtually no progress at all. The reason is that within the field of acculturation research the question has simply not been asked, even though it has been acknowledged that acculturation strategies are dynamic in nature.

To make any substantial headway in understanding multicultural integration in the real world, the reciprocal nature of relationships between variables has to become a centerpiece of our thinking and reasoning. As argued earlier, relatively small changes can have disproportionately large effects on a system. Complementary to this, relatively large changes can have disproportionately small effects. To understand how such processes work precisely, the proposed reciprocal mechanisms should be modeled adequately and investigated in order to see how the resulting dynamics evolve over time.

Clearly, this understanding is tremendously relevant to any attempts to influence and steer the course of such social dynamics in reality. Big efforts and expenditures may in fact be largely ineffective and wasteful, whereas small but well-aimed interventions could be much cheaper and much more successful. Naturally –and supported by notions of a mechanistic science– people tend to believe there is a proportionality between the amount of force applied and the amount of change that results. Dynamical systems theory has shown this to be a fallacy for complex systems, and it is high time that the social sciences catch up with this “new reality”.

Conclusions

In the second series of simulations the dynamical model has been explored to its full extent within the limits of its current formulation. Even though it contains fewer variables than Berry’s original model, it is clear that it shows a complexity far beyond it. Whereas Berry focuses on strategies and groups, the dynamical model gives clear hints about the meaning of specific attitude values and about specific people.

The two series of simulations presented in this chapter have demonstrated that average group attitude values provide an incomplete understanding of multicultural integration if the spread of attitudes in the populations is not taken into account. The simulations using groups with homogeneous attitudes were instrumental in providing insight in the kind of behaviors and outcomes related to specific attitudes, but they did not provide a good understanding of more realistic situations.

Adding individual differences to the model resulted in easy to interpret, linear relations between group attitudes and social integration. At the same time, individual differences could be identified that lie at the basis of several important phenomena that impinge on integration dynamics in a non-linear fashion in reality. Two examples were singled out and discussed,

showing how a relatively small number of individuals can have a disproportionately large impact on the course of intergroup relations and integration. It is important to realize that social dynamics are indeed driven in considerable part by “extreme” people and unlikely events that would escape attention if average values served as the main focus of our attention (Bartoli, Bui-Wrzosinska & Nowak, 2010; King & Langche, 2001; Yaari, Nowak, Rakocy & Solomon, 2008).

Being aware of individual differences in multicultural integration then is only as good as the qualitative understanding of what these differences really stand for. All in all this provides a seemingly contradictory picture that in general multicultural integration can be described by mean group attitudes, but that small numbers of people can potentially thoroughly distort this relationship.

Ironically, these findings seem to reconcile the dynamical model and Berry’s model somewhat on the issue of the qualitative nature of acculturation strategies. This observation signifies a major strength of the dynamical approach. Even though numerical representations underlie every bit of this computational model, it is striking that its outcomes primarily help to form a qualitative understanding of what it tries to explain. This is true for the findings regarding these influential individuals, but also for the results regarding group clustering and social distance.

Importantly, because of the specificity of the simulation outcomes and the qualitative way of understanding them, the model invites discussion and theorizing of how certain problems can be addressed in reality: the model helps to bridge the gap between the abstract theoretical level, and the tangible real world. This shows that the model is not just a tool for reiterating the knowns of Berry’s model and shedding some light on disputed topics, but that it keeps its promise of taking us into terrain earlier inaccessible.

Chapter 6

Simulations of multicultural integration in which agents' attitudes change in response to social interactions

The simulations so far have provided insight into how acculturation attitudes influence multicultural integration. In all the simulations presented so far, the attitudes were fixed, which doesn't stroke with the fact that attitudes change over time. In this chapter a last series of simulations will be presented and discussed in which agents' attitudes towards the outgroup change in response to social interactions with outgroup members. The main interest here is not to just link the formation of patterns of integration to specific values of attitudes, but to identify (local) dynamic processes that are crucial in influencing the state of the entire social system over time, such as those discussed in the previous chapter involving individuals who are marginalized or who form bridges between antagonistic groups.

The model used as the basis for these simulations is the same one as used so far, but a mechanism of attitude change is added to it. It is generally acknowledged that acculturation strategies are subject to change (e.g., Berry 1997), but the topic has not been approached in a comprehensive way unfortunately, and as a consequence there is no clear candidate-mechanism that could be adopted.

Relevant topics such as the effects of discrimination and prejudice have received due attention in general but not in the specific context of acculturation. Studies on discrimination that do take acculturation into account mainly focus on health effects (e.g. Berry & Sabatier, 2010; Dawson, 2009; Liebkind & Jasinskaja-Lahti, 2000; Noh & Kaspar, 2003; Viruell-Fuentes, 2007). Prejudice has been extensively studied in relation to the contact hypothesis -

see Pettigrew (1998a) for a review - but research mainly focuses on the positive outcomes of contact (Pettigrew & Tropp, 2006).

One reason possibly responsible for the lack of knowledge of acculturation attitude change may be related to the difficulty of disentangling cause and effect. Acculturation attitudes influence behavior and therefore impact interpersonal interaction between members from different groups. These interactions in turn influence acculturation attitudes. Hence, cause and effect are not clearly separable and difficult to investigate.

Some studies nevertheless have provided some insight into how acculturation attitudes influence interpersonal contact. Zick and colleagues (2001) have shown that the integration strategy is related to lower levels of prejudice and more positive behavior towards minorities, compared to the assimilation strategy. In contrast to assimilation, integration is characterized by a more positive opinion regarding minority culture maintenance. These results were largely confirmed in another study (Kosic, Mannetti & Sam, 2005). Zagefka and colleagues (2009) demonstrated that the contact acculturation attitude is causally positively related to intergroup affect.

Although the research findings are scarce, it seems that they follow the intuitive pattern that positive attitudes towards contact are related to positive behaviors and feelings, and that preferences for not having contact are related to negative feelings towards the other. Following these lines, for the dynamical model an intuitively appealing principle of acculturation attitude change is adopted, specifying that changes in a person's attitudes after social interaction are in accordance with the attitudes of the other party. This means that an agent's attitude towards the other group will decrease after interacting with an outgroup member who has a negative attitude towards the agent's group. Interaction with a positive outgroup member will result in an increased attitude towards that group. This principle is in line with Deutsch's crude law of social relations (Deutsch, 1973, p. 365) which specifies that

“The characteristic processes and effects elicited by a given type of social relationship also tend to elicit that type of social relationship.”

Presumed in the proposed principle is that the attitude change resulting from interaction with an individual group member generalizes to the entire group. Research on the contact hypothesis has demonstrated that this is often the case, especially when group membership is salient during the interaction (Brown, Vivian & Hewstone, 1999; Dovidio, Gaertner & Kawakami, 2003; Gonzalez & Brown, 2003; Pettigrew, 1997; Voci & Hewstone, 2003). If this is true for positive contact effects, it is assumed to also hold for negative ones. Instances of attitude change in reaction to positive and negative events differ in at least one respect, however. It has been well-documented that negative events have a far larger impact on people than do positive events (Baumeister, Bratslavsky, Finkenauer & Vohs, 2001; Ito, Larsen, Smith & Cacioppo, 1998; Rozin & Royzman, 2001; Taylor, 1991), and this needs to be taken into account in the present mechanism of attitude change.

Before the mechanism of attitude change can be formalized, the magnitude of attitude change resulting from social interactions has to be specified. It is plausible that the strength of a reaction is a function of both the strength of the stimulus and of characteristics of the receiver. In other words, the magnitude of the change in attitude should be a function of the strength of one’s own attitude and of the strength of the attitude of the person one is in contact with.

Changes in attitudes that result from social interaction clearly fall within the domain of social impact (Latané, 1981). Social impact depends on the number, distance and strengths of the sources, which is captured by the following formula, which has been proposed by Nowak and colleagues (1990) in their seminal work on the dynamical theory of social impact:

$$I_i = \left(\sum_1^N \left(\frac{s_j}{d_{ij}^2} \right)^2 \right)^{1/2}$$

I_i denotes total influence, s_j corresponds to each individual's strength, and d_{ij} corresponds to the distance between individuals i and j . In the dynamical model of multicultural integration, strength s is defined by the strength of the agent's attitude and distance is fixed at 1, because agents only interact with directly surrounding contacts. The formula can therefore be rewritten as follows:

$$I_i = \left(\sum_1^N A_j^2 \right)^{1/2}$$

In words, this formula means that the influence exerted on a person is a function of the square root of the sum of the squared attitudes of social contacts¹.

Whether an agent's attitude is influenced positively or negatively depends on the difference between the impact of positively and negatively appraised interactions. If the impact of negatively (positively) experienced interaction is greater than that of positively (negatively) experienced interaction the attitude will become more negative (positive). The impact of positive and negative interaction is thus calculated separately. As mentioned before, negative interactions should weigh more than positive interactions, and that should somehow be taken into account when calculating social influence. It is difficult to know exactly how much more weight to assign to negative interactions in this context. Arbitrarily, negative interactions were given ten times more influence than positive interactions. In the calculations this was achieved by multiplying a negative impact value by ten, before comparing it to positive impact.

Influence on an agent can accumulate over time by repetitive interactions in such a way that its attitude would be propelled towards more and more extreme values, theoretically till

¹ Note that influence can be negative or positive. However, squaring attitude values always results in positive influence, so negative influence would be impossible according to this formula. To circumvent this problem attitudes will not be squared in the usual way but in the form of: $A_j * |A_j|$. Thus, the absolute value of the attitude is multiplied with the attitude value. This results in positive values for positive attitudes and in negative values for negative ones.

infinity. This is problematic for the dynamical model, because it limits attitudes to values within the range of -1 to 1. It also does not fit with the intuitive understanding that there are limits to the extremity of attitudes. It makes sense therefore that the magnitude of attitude change depends in part on the agent's current attitude in such a way that extreme attitudes are inhibited from becoming more extreme, at some point.

To tackle these issues, the magnitude of attitude change in response to social influence was also made a function of the difference between an agent's attitude and the extremes of the attitude scale. More precisely, the direction the attitude was changing was first considered. Next, the difference was calculated between the current attitude strength and the scale extreme towards which the attitude moved. This difference was then squared and multiplied with the social influence. From this it follows that the closer an attitude gets to the values of -1 or 1, the smaller the changes should be in response to equally strong social influence. Once an attitude reaches the value of 1 or -1 it cannot become more extreme. Because the difference with the scale extreme is zero for attitudes of -1 or 1, any social influence pressing the attitude to further polarization would be multiplied by zero, and thus nullified. Attitudes that move away from extreme values towards neutrality do so in relatively large steps because the distance to the opposite extreme of the scale is large. By taking the square of the difference between an attitude and the scale-end, instead of just the difference, larger pressure is exerted on attitudes to return towards neutrality. This is necessary to prevent (to some extent) very quick and irreversible polarization.

Finally, because attitudes usually change in small increments, the calculated social influence was divided by a constant to obtain the actual change in attitude. The magnitude of changes in attitudes does not fundamentally alter the behavior of the system as long as changes are not too large; not larger than a fraction of the attitude scale. What does change is the speed of the processes. By dividing the value by which attitudes change, the dynamics in

the system are slowed down. This makes the dynamic processes better visible and easier to analyze. The constant value was set at 100, which seemed to work relatively well in comparison to other values that were tried. In the simulations, agents' attitudes were updated each time they were selected for movement. Attitude change happened before they evaluated possibilities to move.

From the description so far, it can be deduced that only intergroup interactions are taken into account at this point. This means that agents' attitudes change as a consequence of interaction with outgroup members only. Furthermore, only the attitude towards the outgroup was subject to change; attitudes towards one's own group were left unchanged. Although this limitation does not do justice to the complexity of the matter, including multiple attitude change mechanisms would not be wise because their cumulative effects would be very difficult to understand. Also, for each additional mechanism, additional assumptions and quasi-arbitrary decisions would have to be made, which would further complicate the model. Because the main aim is to understand integration processes between the groups, the mechanism most central to that process was adopted.

It should be noted that because of the uncertainties regarding acculturation attitude change and because of the additional assumptions needed to make implementation in a computer simulation possible, the foundations of this extended model are to a larger degree arbitrary than was previously the case. However, this does not stand in the way of the main purpose of these simulations, which is exploration: uncovering dynamic patterns and identifying possible emergent properties.

Points of particular interest in this series of simulations concern the roles of marginalized agents and agents bridging the gap between segregated groups. Based on the discussion in the previous chapter it is hypothesized that these agents have a disproportionately large impact on the social system as a whole.

Methods

As in the previous series of simulations, these were also conducted on a square grid consisting of 50 rows and columns, resulting in a total number of 2500 cells. Twenty-five percent of the 2500 cells were left open. Two groups were simulated, a majority and a minority, in the ratio 80/20. Average majority outgroup-attitudes and average minority ingroup- and outgroup-attitudes were systematically varied using the following values: -0.50, -0.25, 0.00, 0.25, 0.50. Average majority ingroup-attitudes were fixed at 0.50. Individual differences were included in these simulations: agents' attitude varied around the mean values normally with a standard deviation of 0.35. No attitude values were allowed to lie outside the -1 to +1 range (Majority ingroup attitude were confined to the 0 to +1 range). This resulted in a 5 x 5 x 5 design, with 125 conditions.

Because of the dynamics that result from changing attitudes, it was expected that the simulation outcomes would be more variable than in previous simulations. To limit the impact of random fluctuations on the overall analyses each simulation condition was run ten times, instead of three times as was previously done. The total number of simulations was thus 1250. The initial state of all simulations was a random distribution of agents on the grid. All conditions were first simulated for two thousand cycles *without* attitudes being subject to change. So in fact all the conditions of the previous series of simulations were rerun in an identical manner. Only at that point was the option for attitude change activated. The simulations then continued for ten thousand cycles. The reason for having an initial period without attitude change was for a social structure to form out of the initial random configuration. In this way, it was taken into account that people are part of social structures that emerge through social interaction, and that it is in this context that people change their attitudes. This also means that these simulations in effect were the “sequels” to the series of

simulations with individual differences. (For a more detailed explanation of the workings of the simulations, please refer to chapter three.)

The main dependent variable was social integration between the groups, which was measured by comparing the actual extent of contact between the groups with the extent of contact that would be expected on the basis of randomness. In a perfectly integrated society, culture should not be an issue in interpersonal contacts and thus contacts between the groups should be random when it comes to group membership. Deviations from randomness can then be used to calculate an index for integration. This index has a value of zero in the case of total segregation — no contacts between the groups — and a value of 1 for perfect integration, or a random distribution of contacts.

The main interest in these simulations was how attitudes and contact between the groups evolved over time. As a consequence, representations of time series are used to capture these ongoing dynamics as the main way of representing simulations. Screenshots are also used, but mainly to clarify certain dynamic processes. All time series presented start at the moment when attitude change was activated, after the initial two thousand cycles to create social structure had finished. As in the previous chapter, several specific scenarios will be analyzed first, before analyzing the overall results of all the simulated conditions.

Scenarios of multicultural integration

Segregation

As in previous simulations, the segregation scenario is defined by positive ingroup-attitudes (0.50) and negative outgroup-attitudes (-0.50). This scenario was previously related to very low levels of social integration, which was also the case for the initial states of the current simulations. In quite a few simulations, this state of segregation would thereafter

remain, and mutual attitudes would slowly and gradually become more negative. However, in more than half of the cases something remarkable happened: after an initial phase of segregation and negative mutual attitudes, a sudden rise in intergroup liking was observed, accompanied by increasing levels of social integration. These simulations would eventually result in a situation of very high integration and very positive intergroup attitudes. This process is represented in Figure 1; the black line indicating social integration nearly touches zero at simulation cycle zero. Surprisingly, after eleven thousand cycles the groups have completely integrated: mutual negativity transformed into mutual positivity. Somehow internal dynamics can generate a process of positivity in the most unfavorable conditions. This is extraordinary, especially given the fact that negative influence outweighs positive influence by a factor ten.

What can be seen in Figure 1 is that minority and majority attitudes and social integration closely follow the same pattern. These patterns are markedly S-shaped, which indicates that there are distinct stages of evolution in the simulation.

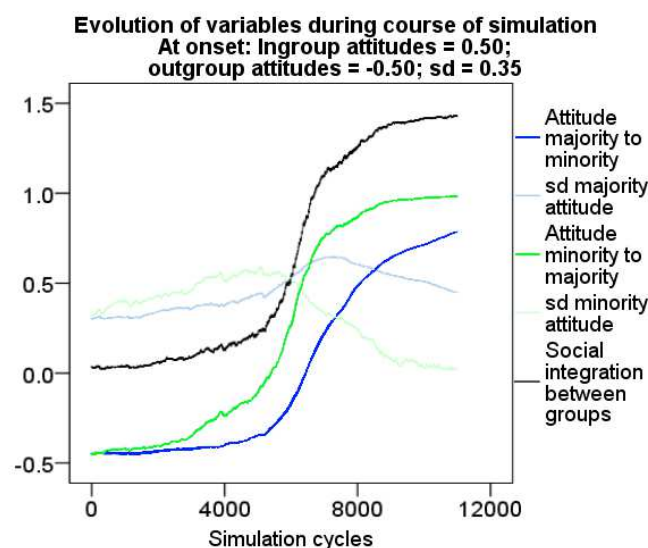


Figure 1

Time series of a simulation in which all agents had ingroup-attitudes of 0.50 and outgroup-attitudes of -0.50; standard deviation 0.35. Agent's attitudes changed in response to social interactions during the simulation.

A last thing to notice is the relationship between the standard deviations and the attitudes. As attitudes begin to increase rapidly (middle part of S-curve) standard deviations also increase. Once the curve of attitudes begins to level off, standard deviations decrease again.

The fact that simulations of the same scenario resulted in such different trajectories makes it clear that some internal dynamics must lie at the basis of these contradictory outcomes. In order to gain insight into what precisely happens during the simulations, screenshots had to be analyzed in detail. Screenshots taken at fixed intervals during the Figure1 simulation are presented in Figure 2, and will be used to explain the mechanisms responsible for these surprising results.

At the onset (panel displaying cycle 0), very little intergroup contact exists. A few individual minority members with positive outgroup-attitudes have integrated into the majority group at various locations, and a small contact zone between the groups exists on the lower right side of the screenshot, formed by mutually positive agents. This situation is very similar to the simulation displayed in Figure 8 in chapter 5. What happens during the next thousand cycles is that most of the individually integrated minority members have disappeared, but that a few minority members have clustered together within the majority group, surrounded by positive majority members. The lighter colors indicate that inside this pocket mutually positive attitudes have become stronger. The contact zone between the groups still exists and also here mutual attitudes have become more positive, although the size of this zone has not increased. After two thousand cycles, the pocket of integrated minorities has increased in size. A contact zone between the groups still exists, but has changed to a different place. The size of the zone has become larger and along the zone attitudes increase in positivity. After the next two thousand cycles, the integrated pocket has increased in size and is causing a larger number of agents to have positive outgroup-attitudes.

The contact zone between the groups is increasing in size as well and has changed location again. So far these phenomena had been local and small-scale. Around cycle five thousand, this pattern starts to change; the minority group is now affected at large by increasing positive attitudes and starts to disintegrate and spread among the majority. This is the start of an autocatalytic process that transforms an initial predominantly negative society into a positive one. By cycle seven thousand the minority has nearly completely integrated into the majority, and all majority members who are in contact with minorities have become very positive. In the last screenshot, taken after nine thousand cycles, the minority has completely integrated. Clusters of negative majority members still exist, but are decreasing in size and number and would eventually disappear.

The three distinct stages discovered in the time series graph are easily identified in these screenshots. The first five thousand cycles are calm, with seemingly little happening. Suddenly, in the next two thousand cycles, the social landscape goes through a fast transition. After that, from cycle seven thousand onwards a consolidation phase starts in which the system slowly evolves in a further positive direction. The clues to understanding this remarkable pattern have to be sought in the initial calm phase. During this period the prerequisites are slowly forming that cause the quick transition later.

The only thing happening during the initial phase is the slow growth of a few local integrated areas. The fact that they grow is crucial, because that makes them stable incubators of positive relations. The few lone integrated minority members who were present in the early cycles also generated some positivity around them, but they quickly disappeared. Small clusters are highly affected by the moving of central agents and therefore tend not to last over time. Also, agents in a small cluster can be relatively easily influenced to become negative. In a larger cluster, agents can more effectively reinforce each other positively, adding to the stability of the cluster.

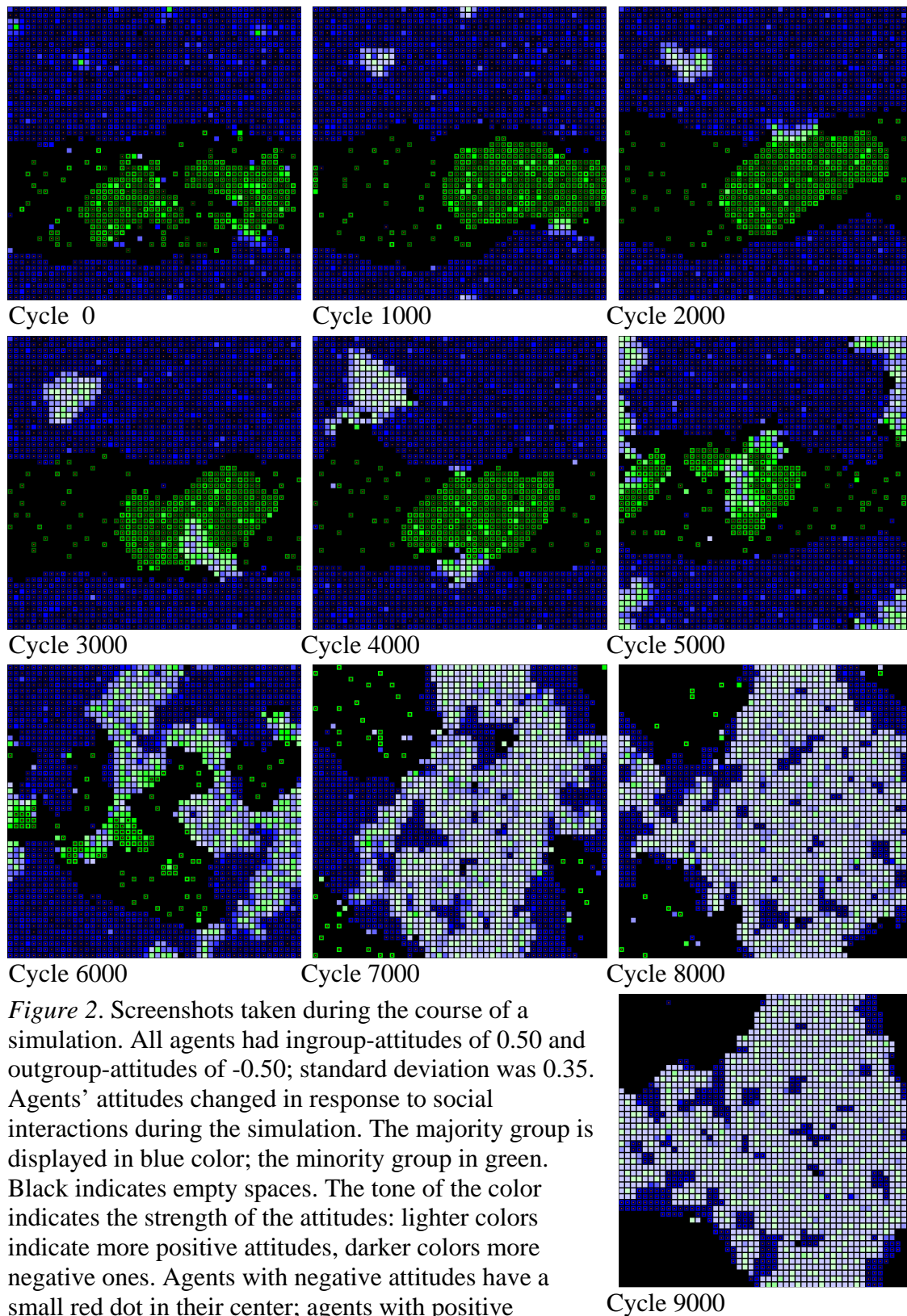


Figure 2. Screenshots taken during the course of a simulation. All agents had ingroup-attitudes of 0.50 and outgroup-attitudes of -0.50; standard deviation was 0.35. Agents' attitudes changed in response to social interactions during the simulation. The majority group is displayed in blue color; the minority group in green. Black indicates empty spaces. The tone of the color indicates the strength of the attitudes: lighter colors indicate more positive attitudes, darker colors more negative ones. Agents with negative attitudes have a small red dot in their center; agents with positive attitudes are uniformly colored.

Larger clusters are more than just stable, however. Although stability is important, it is not a sufficient explanation for continuing increasing positivity, because even stable clusters do not have positive influence outside their direct boundaries. What is crucial is that the larger a cluster is, the more readily it attracts or “converts” new agents. In larger clusters, opportunities for interested agents to join appear more often. This is especially the case if clusters have an open border towards social space, i.e. when they have an opening to empty social space. In such places, agents can join without having to wait for an agent to move away in order to make a vacant place available in the cluster.

Once a sufficient number of minority members have become positive towards the majority, their group structure disintegrates. This marks the onset of large scale transition from negative to positive group relations. As long as both groups are highly segregated it is nearly impossible for a positive agent to engage in contact with the other group. Positive agents prefer contact with members of both groups, and opportunities for this are scarce as long as the groups are entirely segregated. If the other group is nevertheless approached, this often involves a reduction in the number of ingroup contacts. Moreover, the resulting interaction with members of the other group is often negative, because most outgroup members have a negative attitude. What happens then is that the attitude of the approaching agent decreases as a result of contact, and that the outgroup members move away in order to avoid contact. The result is a lone agent with a more negative attitude towards the other group than before. The next logical step is that the agent joins the ingroup cluster again, but with a reduced likelihood to engage in future intergroup contact. However, with larger integrated clusters, the opportunities to be in contact with both ingroup and outgroup increase. In addition, as can be seen in the panel displaying cycle five thousand, majority members enter the minority cluster. At this point it becomes increasingly difficult for minority members to escape contact with positive majority members because the latter start to actively approach

the minority while at the same time more and more minority members join integrated clusters. The breaking up of the minority cluster signals that they en masse join integrated clusters inside the larger majority. As a result, many initially negative majority members become exposed to positive minority members, accelerating the process.

Once all minority members have integrated into the majority, a number of negative majority members remain because they have successfully escaped contact with minorities so far. Eventually, after many thousands of additional cycles, they would also become positive after having experienced enough random encounters with minority members.

In cases when the scenario of initial segregation does not lead to high integration in the end, the process looks something like is displayed in Figure 3.

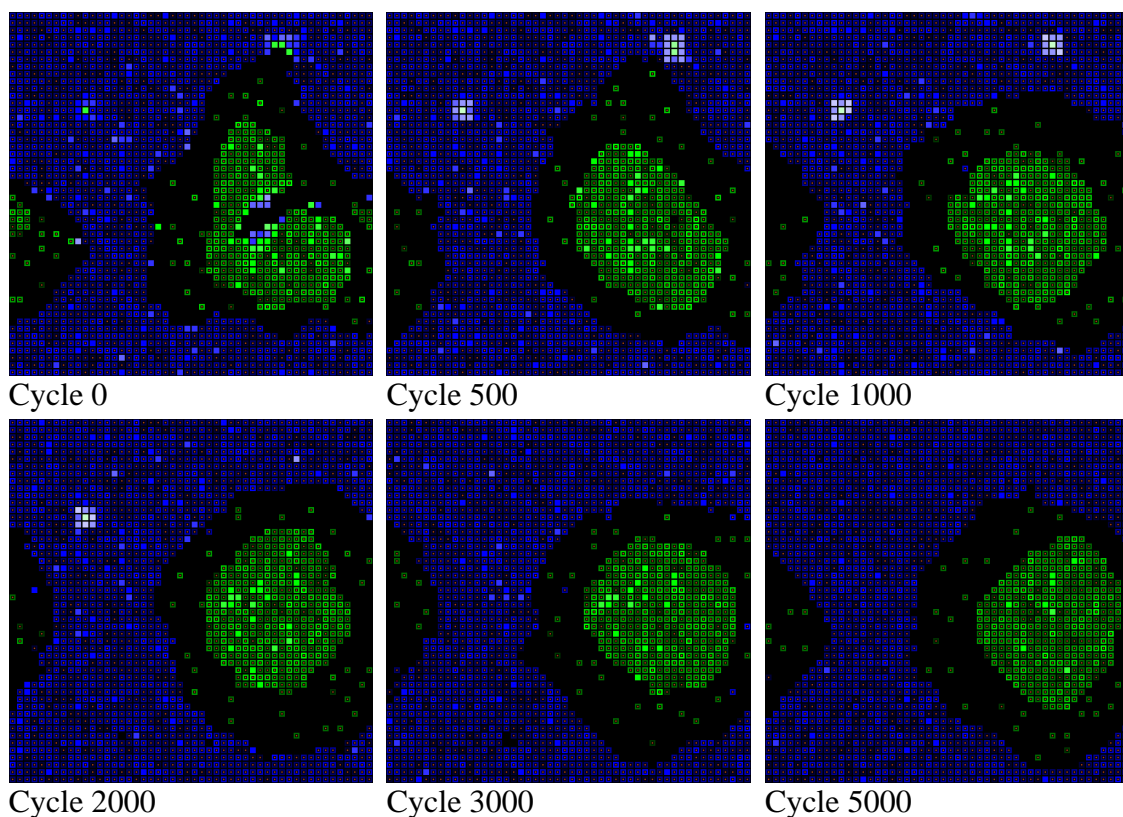


Figure 3

Screenshots taken during the course of a simulation. All agents had ingroup-attitudes of 0.50 and outgroup-attitudes of -0.50; standard deviation was 0.35. Agents' attitudes changed in response to social interactions during the simulation. The majority group is displayed in blue color; the minority group in green. Black indicates empty spaces. The tone of the color indicates the strength of the attitudes: lighter colors indicate more positive attitudes, darker colors more negative ones. Agents with negative attitude have a small red dot in their center; agents with positive attitudes are uniformly colored.

At the onset, at cycle zero, there are a few places where intergroup contact exists. They disappear relatively quickly, however. The few integrated minorities were not joined by others and so no clusters emerged. Also the few majority members who were initially in contact with the minority disappeared quickly because of a lack of contact with ingroup members and likely negative experiences with the minority. Once the groups segregate, intergroup contact becomes sparse. The little contact that does take place is usually negative, slowly pushing the groups towards more and more extreme mutual attitudes.

Integration

The integration scenario is characterized by positive ingroup and outgroup attitudes (0.50) and was related to a high level of social integration in previous simulations. Not surprisingly, the already positive mutual attitudes and high level of social integration developed into further positivity and integration. Because agents had initial positive mutual attitudes, most interactions were of a positive nature, making attitudes even more positive. As can be seen in Figure 4, standard deviations decreased during the simulation, especially for the minority in the early stages of the simulation. The reason for this is that the overwhelmingly positive interactions quickly ensured that agents with initially low attitudes became more positive, which led to more uniformity in the groups. The graph shows that minority group processes evolved at a larger speed than did majority group processes. The reason for this is that a small number of people is generally more readily affected than a large number of people. A last thing to notice in Figure 4 is that social integration followed the positive trend of the mutual attitudes.

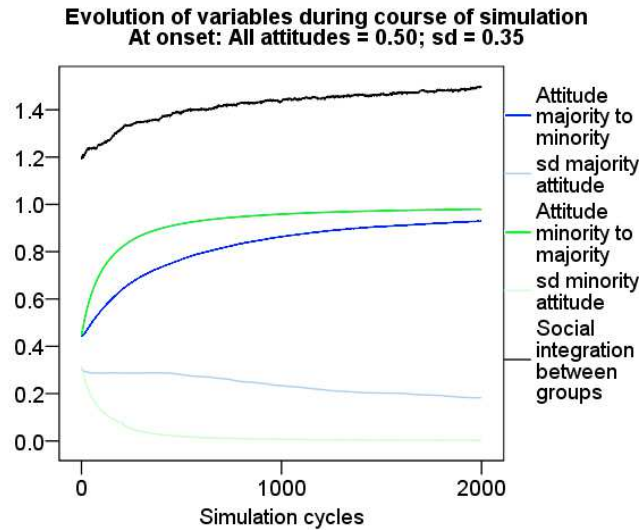


Figure 4

Time series of the first two thousand cycles of a simulation in which all agents had ingroup- and outgroup-attitudes of 0.50; standard deviation 0.35. Agents' attitudes changed in response to social interactions during the simulation.

Tolerance

Simulations of the segregation scenario showed that despite initial mutual negativity a positive outcome is possible. Scenarios in which the groups are mutually neutral on average should thus be expected to lead to invariably positive outcomes. Surprisingly this is only the case if minority *ingroup* attitudes are at least moderately positive. When minority ingroup attitudes are neutral or negative, segregation is an inevitable outcome. In the following scenario, the groups were on average neutral towards each other (outgroup attitudes of 0.00), the majority had a positive ingroup attitude (0.50) and the minority had a neutral ingroup attitude (0.00). The evolution of this scenario is shown in Figure 5.

The very early phase the simulation is quite dynamic. Because the outgroup attitudes are neutral only on average, this means that many agents have either a positive or negative attitude towards the other group, and that many majority and minority agents have incompatible attitudes, which results in movement. Soon agents adapt and find a place to settle. This process is paired with slightly decreasing attitudes and a drop in social

integration. Integration levels do not become dramatically low, however, and on the basis of earlier findings positive developments should be expected. After the initial dip, outgroup attitudes indeed increase somewhat, but then start to become more negative. An explanation has to be sought in the direction of minority ingroup attitudes.

A low level of ingroup attitudes means that there are a relatively high number of agents who wish to avoid contact with other ingroup members. Some of them have positive outgroup attitudes and will seek contact with the majority, other have negative outgroup attitudes and will avoid contact with both groups. Both of these two types of agents –whether their outgroup attitudes are positive or negative–contribute directly or indirectly to decreasing attitudes, although in different ways.

Minority agents with positive outgroup attitudes may integrate into the majority, but because of their wish not to have contact with other minority members they will not form larger clusters. In fact, these agents are likely to move as soon as another minority member arrives. As a consequence, the cluster growth mechanism responsible for increasingly positive attitudes that was observed in the segregation scenario never takes off. Additionally, as was explained and shown before, single integrated individuals will eventually move, leading to decreased integration. This is only half of the explanation, though, because there should be enough other minority agents that do have positive ingroup attitudes to start clusters of positive dynamics.

The second half of the explanation, then, regards minority members with negative attitudes to both ingroup and outgroup, e.g. agents with the marginalization strategy. In general, these agents have very few social contacts; the contact that does occur is predominantly made up of random encounters. These encounters will influence these agents sometimes positively, sometimes negatively, but are unlikely to cause major changes overall. The effects these encounters have on the majority members involved are always negative

though. So in a sense the presence of these marginal agents forms a mechanism of negativity. If such mechanisms are not counteracted by stronger positive mechanisms, the system at large cannot but evolve towards negativity. Because the number of agents with the marginalization strategy in this scenario was relatively large, the mechanism of negativity was stronger than the mechanism of positivity.

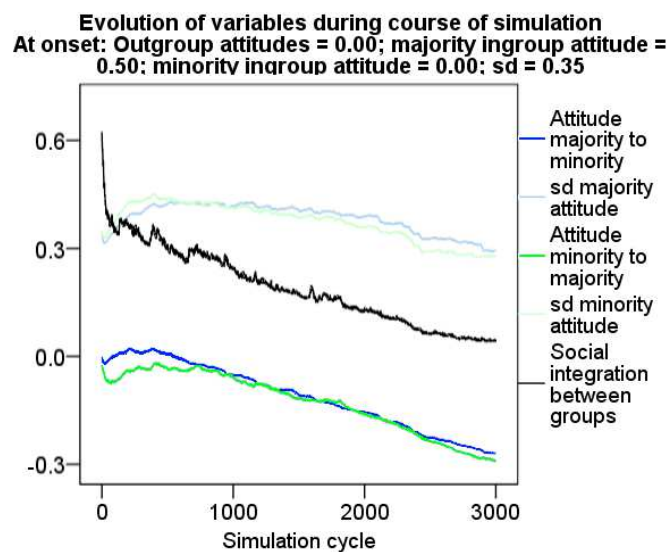


Figure 5

Time series of the first three thousand cycles of a simulation in which all agents had outgroup-attitudes of 0.00; majority ingroup-attitude 0.50; minority ingroup-attitude 0.00; standard deviation 0.35. Agents' attitudes changed in response to social interactions during the simulation.

Opposite contact wishes

An interesting case occurs when the groups have incompatible attitudes, i.e. when one group is positive towards the other, whereas the other group is negative. Figure 6 shows the evolution of such a scenario. In this example, minority members were positive towards the majority (attitude = 0.50), but the majority was negative towards the minority (attitude = -0.50). Right at the onset of this simulation, minority outgroup attitudes and social integration plummet. Initially positive minorities approach the majority, but quickly become negative

after experiencing contact with negative majority members. As a consequence, they no longer seek contact with the majority, causing social integration levels to fall. Despite this severe negative impact, several contact zones are formed. These zones, much in the same way as in the previously discussed segregation scenario, drive mutual attitudes and social integration upwards again. This process goes much faster than in the previous scenario, because the initial positivity of the minority ensured that enough majority members (although few in comparison to the total size of the majority group) also adopted positive attitudes to form contact zones large enough in size and number to generate more positive intergroup relations.

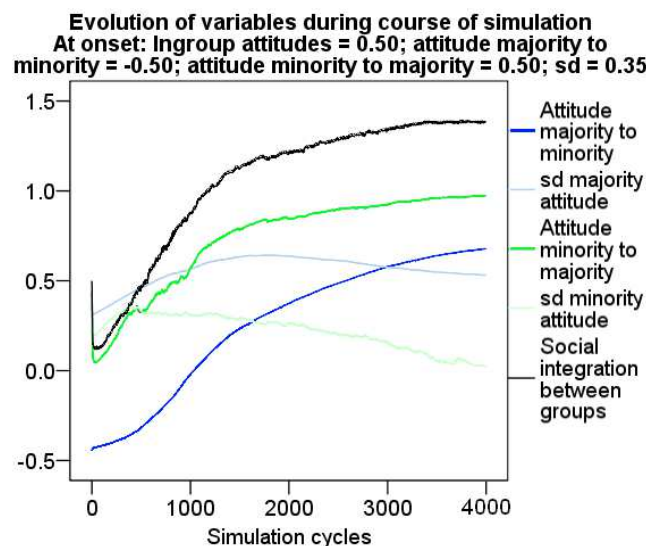


Figure 6

Time series of the first four thousand cycles of a simulation in which all agents had ingroup-attitudes of 0.50; majority outgroup-attitude -0.50; minority outgroup-attitude 0.50; standard deviation 0.35. Agents' attitudes changed in response to social interactions during the simulation.

Overview of results of all simulated conditions

An overview of how social integration is related to the initial average attitudes (before they were subject to change) in all the 125 scenarios is provided in Figure 7. It is clear that the pattern of outcomes here differs radically from the linear patterns observed in the

outcomes of the previous series of simulations, in which attitudes were not subject to change. More specifically, the outcomes are relatively uniform, in the sense that different combinations of initial attitudes result in identical levels of integration. A partial explanation for this is that the outcomes in general seem to be a bit polarized; either very high levels of integration, or very low ones.

Because of the surprising impact minority ingroup attitudes had in one of the earlier scenarios, a question of particular interest is to what extent this variable is important in determining outcomes overall. In order to answer this, the effect sizes (omega-squared) of the three variable and their interactions were calculated on the basis of a univariate analysis of variance of the current simulations, with social integration as dependent variable and initial majority outgroup-attitude and minority outgroup- and ingroup-attitudes as independent variables. The results are presented in Table 1.

Table 1

Effect sizes for the influences on social integration of all main effects of minority ingroup- and outgroup-attitudes, the majority outgroup-attitude of and all the interactions between these variables

Term	ω^2
Attitude majority to minority	.214
Attitude minority to majority	.109
Attitude minority to own group	.312
Interaction attitudes majority to minority and minority to majority	.044
Interaction attitudes majority to minority and minority to own group	.061
Interaction attitudes minority to majority and minority to own group	.019
Interaction of all three attitudes	.087

It is a big surprise to find that the initial minority *ingroup* attitude is now the most influential variable overall, with an effect size of 0.312. The majority outgroup attitude is still important, with an effect size of 0.214, and the minority outgroup attitude has half the impact

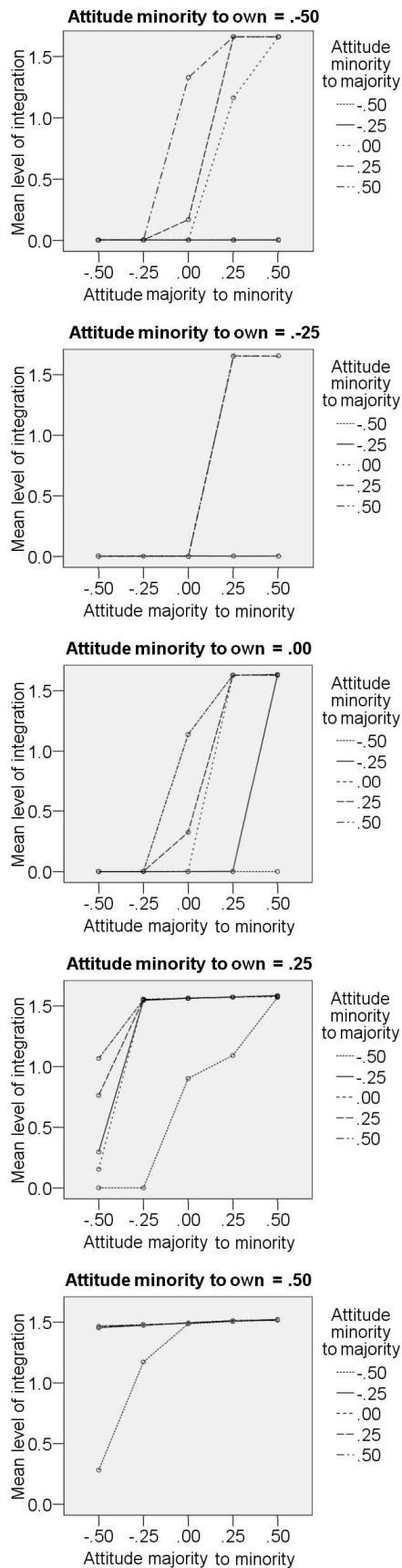


Figure 7. Relation between initial acculturation attitudes and social integration for 125 scenarios.

of that, with a value of 0.109. The interaction terms are all of smaller magnitude, with the interaction between all three variables having the largest effect, with an omega-squared value of 0.087.

These outcomes strongly break with the patterns observed in earlier simulations. Not only is it new that the majority no longer has the largest impact on the resulting state of integration, but also that the minority's ingroup attitude has a stronger impact on the level of integration between the groups than their outgroup attitude. Figure 7 provides a complete picture of the relationship between the variables and allows for a more detailed analysis. Concerning the influence of the minority ingroup attitudes, there is a notable contrast in the level of integration between absolute positive attitude values (higher than zero) and non-positive attitude values. As minority ingroup attitudes increase from .00 to .25 and from .25 to .50, the influence of the majority and minority outgroup attitudes generally becomes overridden and the output largely determined by this variable alone. Even scenarios in which initial mutual attitudes on average were negative can now result in very high levels of integration. All in all the majority outgroup attitude is still of considerable importance, with low levels of integration generally connected to initial

low levels of majority outgroup attitudes, but quite often data points in the graph lie on a horizontal line, indicating limited variability, and thus impact related to this variable. The influence of the minority outgroup attitude can mainly be identified by the overall lower levels of integration when the minority has a strong initial aversion to contact with the majority.

Discussion

The outcomes of these simulations are entirely in line with the expected large impact of marginalized agents and “bridging” agents in scenarios of segregation. The simulations also show how this influence is exerted –the dynamics in which these agents are involved. Surprisingly, it turned out that minority ingroup attitudes are the most important factor for these results. It was observed that positive minority ingroup attitudes are instrumental and often even crucial for social integration on the long term, for instance. This sounds counter-intuitive because positive ingroup attitudes also cause group clustering, which should hamper social integration. The explanations for this seeming contradiction have to do with the specifics of the dynamic processes that underlie these outcomes.

First of all, because agents are only affected locally, by direct contact with others, there is always space for different kinds of dynamics to happen simultaneously in different places within the larger social system. These dynamics can either have a positive or a negative impact on agents’ mutual attitudes. What determines the course of the system in the long run is the balance between the two kinds. Negative dynamics are usually relatively short lasting, but large in number, whereas positive dynamics tend to be longer lasting but smaller in number.

To ensure high levels of multicultural integration then, dynamic processes that foster mutual liking and integration need to be lasting and need to expand, so that they can

eventually outweigh the impact of negative dynamics. Expansion happens if clusters of agents involved in positive dynamics grow. Hence, crucial in understanding these simulation outcomes are the reasons for and processes how agents join these clusters of positive dynamics.

The two main determinants of the likelihood of new agents joining a cluster are agents' motivation to join, and the opportunities for joining. Minority ingroup attitudes turn out to play an important role in both, explaining why this variable is so important in these simulations.

Obviously, clusters constituting centers of positive dynamics can only be sustained by agents with mutually positive attitudes. This holds not only for agents of different groups, but also for agents of the same group. A minority member wishing to avoid contact with other minority members is not likely to join an integrated cluster, because this would entail having contact with same-group members. For this reason, a negative minority ingroup attitude in general inhibits positive dynamics and social integration.

The second way in which minority ingroup attitudes are implied in positive dynamics is related to the ease of new agents joining a cluster. The likelihood of a positive cluster growing increases with greater numbers of opportunities for willing agents to join. This in large part depends on the location of the cluster in social space. If a cluster is embedded, or rather enclosed within a larger group, it is difficult for new agents to join because of a lack of vacant spaces inside or adjacent to the cluster. However, a cluster at the fringes of a social group or at a contact zone between two groups has "open ends" and can therefore easily be joined by those who want to.

Contact zones between groups have proven to be especially fertile incubators for positive intergroup relations. In these scenarios, the groups are to some extent clustered from the beginning, providing stable places for most group members. Once the groups come into

contact, initially by chance, some selection takes place. Agents with negative outgroup attitudes are likely to leave. The free spots are usually quickly taken by those preferring contact with agents from both groups, as these spots offer that unique opportunity. Because opportunities to join an integrated cluster are relatively abundant in places where homogeneous groups come into contact, positive cluster growth is helped if minorities have positive ingroup attitudes.

In addition to the reasons listed so far regarding the ways in which positive minority ingroup attitudes promote social integration between groups, these attitudes are also instrumental in preventing negative dynamics. Negative dynamics typically take place between agents with incompatible outgroup attitudes, as mutually disliking agents usually do not approach each other. The one agent with a positive outgroup attitude will approach a negative agent of the other group and be negatively impacted by the interaction(s) until one of the agents leaves. Because negative experiences weigh ten times as heavily as positive ones, the net effect of such interactions is negative. These experiences are most likely to happen to minority agents with a negative ingroup attitude, and a positive outgroup attitude. Such minority agents, when trying to assimilate to an on average negative majority will very quickly become disappointed and lose their motivation to try further. As a result, they end up as unhappy loners without a clear social context, and will in turn become a source of negative interactions. Even though the amount of social interaction these agents have is limited, with time these interactions constitute a stable source of negative influence which, if accumulated, influences the social system at large. As the groups slowly grow more negative towards each other, the prospect of positive interactions leading to a process that could turn this tide becomes fainter.

By contrast, agents with positive ingroup attitudes do not have the same need to get in contact with the majority, because they can be relatively content having contact with minority

members only. This indeed leads to segregation, but these segregated groups “protect” those agents who have positive outgroup attitudes as they are shielded from the overwhelmingly negative experiences with the majority inside their own-group cluster. If at some point in time it happens that the different groups come close to each other in social space, then there is a possibility for these agents to find a place where they can be in contact with members of both groups simultaneously and as a consequence a contact zone between the groups can emerge. So, by preserving the potential for positive interactions in this way, these homogenous clusters play an important role in facilitating the formation of clusters of positive dynamics.

Note that the finding that minority ingroup attitudes are the most influential factor in this series of simulations does not contradict the findings of the previous series of simulations, in which it was found that the majority exerted more influence than the minority. Minority ingroup attitudes play a crucial role in the evolution of mutual attitudes over time, and in that way determine the rate of social integration in the long run. However, in a given moment of time the pattern of intergroup relationships is under larger influence of the majority outgroup attitudes. The pivotal dynamic role played by minority ingroup attitudes is observable only over a very long time frame and this does not imply that it has the same explanatory power at any given specific time.

The overall image provided by these simulations is fairly optimistic; under seemingly less than ideal circumstances high levels of multicultural integration can still be attained, and a preference for minority ingroup contact might not lead to just segregation but can ensure integration on the longer term. An important question is how realistic these outcomes are. One aspect of these simulations that seems strikingly out of line with reality is that either total integration or total segregation is achieved in the end, but nothing in between. (Any

intermediate values in Figure 7 result from not all simulations in one condition ending up in the same state.) This is mainly caused by an inherent instability in these social systems that make them stabilize only at extreme attitude values. This instability is related to the ways in which people change their attitudes and perceive interactions, and despite many efforts it was not possible to produce a social system and simulations with enduring diversity in attitudes.

It is possible that these trends are to some extent realistic, but that the time frame in the simulations does not compare to the references we commonly use. The simulations were allowed to run for ten thousand cycles, but it is entirely unclear how long that would be in real time. The early stages of the simulations are diverse and dynamic, and display processes that are relatively realistic. It may be the case that the inherent instability of the early stages of the simulations exists, but that they do not lead to the long term stable outcomes of the simulations. Human history has been marred with warfare and violence, which is a clear indication of social system instability. Such behaviors are not represented in the simulations, but it is not difficult to imagine that the extreme negativity sometimes present in the simulations would actually lead to violence in reality.

Overall, however, it is clear that these simulations are not an accurate model of reality. It is doubtful for instance that processes of attitude change happen in the way as adopted in the model. The general principle that positive (negative) interactions produce positive (negative) outcomes is defensible, but very coarse. Clearly many more mechanisms exist that influence people's acculturation orientations besides first-person interactions with outgroup members. The role of government, culture, society-specific characteristics and the media (to name a few) are all important forces that were not considered.

The goal however was to follow Nowak's principle of dynamical minimalism (2004) and construct a model as simple as possible capable of displaying the behaviors of interest. The model has been very successful in displaying behaviors of interest as it yielded several

emergent properties. Some of the outcomes observed in the current simulations were predicted on the basis of the results of the previous series of simulations described in chapter five. It has turned out exactly that a relatively small number of individuals can have a disproportionate effect on a social system, in both positive and negative ways as predicted. Social bridges between segregated groups indeed may make the difference between worsening and improving intergroup relations on the long run, and marginalized individuals in some situations are at the center of a negative dynamic process that can steer the course of the entire social system.

The concordance of the current results with previous expectations is important, but an important contribution of the current series of simulations to the overall discussion is the suggestion that minority ingroup attitudes play such an important role. A question of high interest then is if minority ingroup attitudes are indeed implied in these dynamics in ways suggested by these simulations

Answering that question is not so straightforward. The simulations hint at the importance of micro-level social processes that take place within individuals' social networks. Most social scientific research tends not to focus on such processes as they are relatively hard to observe and qualitative in nature. Exceptions to this rule are two independent studies conducted on specific neighborhoods, one in Antwerp, Belgium (Peleman, 2002) and the second in Sydney, Australia (Dunn, 1998), that, in accordance with these simulation results, link ethnic clustering to positive outcomes for minorities *and* for intergroup contact. Of course, these studies are snapshots that may not to be representative of other situations with comparable levels of segregation. It remains unclear, therefore, to what extent these specific simulations outcomes apply to reality, but at least it seems not to be an impossibility.

The general observation of positive dynamics sprouting from interactions between agents with mutually positive attitudes is in accordance with the large body of research on the contact hypothesis and thus not problematic. What happens if attitudes are not mutually positive is much less clear. In the simulations, marginalized minorities play the negative catalytic role that was expected at the macro level, but at the micro level their behavior seems rather unrealistic. Because of negative attitudes towards all groups, these agents usually have no lasting social contacts at all. In reality, people usually do not live without at least some stable social contacts. It is plausible though that minority member with negative attitudes towards all groups are less well embedded in social networks and would have few or fewer contacts than others. Also the importance or significance of these contacts could be different than for most other individuals.

Marginalized individuals should maybe not be seen as having no social contacts at all, but rather as not being rooted in a social environment in which the norms, values and practices of either heritage culture or majority culture play important roles. This interpretation fits well with the observations that in simulations such agents are disconnected from both groups. From this perspective, marginalized individuals should be expected not to have a clear identity based on any group membership, at least not in an ethno-cultural way. This notion is indeed supported by a body of evidence (Phinney, 1990). Problematic behavior could be explained as being a consequence of the absence of value-based regulatory mechanisms and cultural norms that a social environment normally provides. It is well known that young second generation immigrants sometimes, or even often, have to deal with discrepancies between values of the majority group and of their own ethno-cultural group, and that conflicting demands from society and family can have adverse effects on family life (Kwak, 2003; Phalet & Schonpflug, 2001). It is a logical consequence that some youngsters may choose to withdraw from the sphere of moral influence represented by their family or

ethno-cultural group in general. Relatively large value discrepancies have in fact been associated with lower psychological and socio-cultural adaptation (Phinney & Vedder, 2006).

In circumstances where the majority is largely negative towards the minority, it was observed that agents who initially preferred assimilation often developed negative attitudes towards the majority over time because of repeated negative interactions. When these agents' outgroup attitudes turn from positive to negative, they become marginalized with the implications discussed above. Whether this would actually happen in reality is a bit of an open question. One might think that when people become disappointed with the majority group, they may turn their focus to their heritage group instead. This does not have to be the case. Two independent studies on the effects of majority discrimination on minorities came to the conclusion that having more experiences of discrimination was either not related to orientation towards the own culture (Juang & Cookston, 2009) or that it was related to placing *less* importance on culture maintenance (Ruggiero, Taylor & Lambert, 1996).

It seems that there is some ground to believe that when minority members have negative ingroup attitudes this may hamper social integration. But whether minority ingroup attitudes are implied in positive dynamics in the same way as in the simulations is less clear. The simulation outcomes lead to the hypothesis that minority members with positive attitudes towards both ingroup and outgroup should play a facilitative role for others to socially integrate into the majority. Minority members who have positive attitudes towards the majority, but not towards their own group, are not expected to play this role. Unfortunately, there seems to be little research that says anything about this. Another hypothesis that follows from the simulation results is that in case the majority is largely negative towards the minority, minority members with positive ingroup attitudes should also be more positive towards the majority than minority agents with negative ingroup attitudes. Again, there seems to be little data to verify this.

In terms of practical applicability, these results strongly suggest that minority members should be prevented from developing marginalization acculturation strategies. Social exclusion by the majority should be prevented or counteracted, because it has very negative consequences (Laachir, 2007; Twenge, Baumeister, Tice & Stucke, 2001; Twenge, Catanese & Baumeister, 2002). There is of course already broad consensus on this topic, but the present research stresses the paramount importance of this issue for practical reasons, not on ideological or philosophical grounds: social exclusion is not bad just because it is amoral, but because it is deeply dysfunctional in establishing a socially integrated society.

The best way of preventing marginalization, these simulations suggest, is not by ensuring a positive attitude towards the majority however. Rather, positive ethno-cultural group membership should be promoted. This is particularly necessary when minorities are excluded by the majority, because it is then constitutive of the only viable acculturation strategy that does not necessarily entail negative consequences. Trying to promote better attitudes towards the majority would be futile because such attempts would be easily outweighed by the negative day-to-day experiences of discrimination and exclusion. To achieve better ingroup attitudes it may be necessary to support minority cultures and communities, but in such a way as not to simultaneously undermine the perceived position of the majority culture.

In order to promote positivity, intergroup contact has to be facilitated. As much research has demonstrated, there have to be opportunities for people from different groups to meet each other voluntarily and in a positive atmosphere. These should likely not be random interactions, but contact between self-selected individuals. This can be simple day-to-day social contact, but it has been argued that in situations of strong enmity, institutionalized contact may be more effective (Varshney, 2001). Groups in reality also meet involuntarily,

for instance in the context of work or education. In these settings, the potential for negative interactions should be made as small as possible.

In the end, the future of the social system depends on the balance between the dynamics that generate positivity and those that generate negativity. Positive clusters can exist in a negative environment but if their number or size does not increase this is a sign that the system is not progressing and will possibly develop towards enmity. Effective social policy to promote multicultural integration therefore is more likely to consist out of nimble small scale interventions and measures that impact important dynamics locally making use of the social momentum that is inherently present in the system. Full scale measures trying to affect the system at all places at once may well be much less effective, especially if these efforts work against the natural stream of the systems dynamics.

Conclusions

As is often the case with complex dynamical systems, the macro-level outcomes in these simulations did not result from the micro-level interactions in an intuitive way. These simulations have shown why theories constructed on observations of either the macro or the micro level alone will unlikely be able to provide deep understanding of such a complex dynamic process as multicultural integration. The relationships between the levels are not linear, and cannot be captured by our traditional “A causes B” approach. The experimental approach, relying on studying effects in isolation, is very good at uncovering causal links between two variables, but is less suited to investigate dynamic effects, because they express themselves *only* through interaction over time.

In terms of outcomes, this study has shown that, surprisingly, the attitudes of minority members towards their own group were crucial in understanding social integration in the long run. Positive ingroup attitudes were observed to be decisive in securing the potential for high

levels of integration on the long run; whereas negative ingroup attitudes in combination with negative outgroup attitudes were related to deteriorating intergroup relations. The development of the state of the social system over time at the macro-level cannot be well predicted by looking at the average attitudes of each group, however. Rather, it is the presence or absence of specific local social dynamics that is the driving force. This insight makes it clear that the time frame used when looking at a phenomenon like multicultural integration can determine the possible conclusions of a study. If a short time frame is used, one will observe a negative correlation between minority ingroup and social integration, and thus the most likely conclusion will be that positive ingroup attitudes are related to clustering, and so prevent social integration. As shown in this study, the opposite may actually appear to be true if a much longer time frame is used.

It is of course difficult to determine to what extent the simulation outcomes are true to life, and therefore what the direct value of these specific outcomes is. Even so, the results are specific enough that they can be used to formulate a number of testable hypotheses. Importantly, these simulations have shown is that such hypotheses need to be focused on social processes and not only regard relationships between variables.

Chapter 7

Comparison of simulation results with large scale survey data, using sociological and psychological variables

The work in the preceding chapters showed how a simplified psychological theory can be transformed into a formalized model which, with the help of computer simulations, can be scaled up to represent phenomena that are often approached from a sociological point of view rather than from a psychological one. What makes this approach special is not the fact that it relates individual psychological variables to structural sociological ones (Sidanius' and Pratto's Social Dominance Theory [1999] is an excellent example of a theory also accomplishing this), but that it is able to do justice to the interactive dynamical nature of the social processes underlying these relationships. As such, this model is able to help explain the causal relationships between the micro- and macro level, by providing insight into the temporal evolution of the social system.

The aim is thus not to try to capture higher-level phenomena solely in terms of lower-level variables –to reduce sociology to psychology. The general explanatory approach advocated here should be characterized as complementary: both structural and individual variables are needed to understand multicultural integration, and they are causally linked in reciprocal ways.

The fact that it is true theoretically that variables at different levels of analysis are linked in intricate non-reducible ways does not have to mean that a well functioning practical model cannot be constructed by using a limited number of variables at only one level. Multicultural integration might seem to be foremost a structural issue affecting large groups and societies and can possibly be relatively well understood using social and economic

variables. Clearly, there are many psychological aspects to education, social status, occupational life, etc., but does knowledge of, for instance, acculturation attitudes add anything practically relevant to this picture?

The simulations discussed in the previous two chapters suggest the existence of non-linear relationships between acculturation attitudes and intergroup relations, which would indicate an affirmative response to the previous question. But the structural situation of the people central to these non-linear dynamics could possibly also be well captured in terms of education, occupation or social status and thus still be in large part understood in non-psychological terms. An important question then is whether a more comprehensive approach, containing psychological constructs in addition to socio-economic and structural ones, would result in a better working model for practical application.

Because of questions like these, it would be valuable to investigate multicultural integration, or at least the social aspects of it, using simultaneously structural measures such as education, income, occupational status, etc, and psychological measures such as acculturation attitudes. It is beyond doubt that variables related to socio-economic status have predictive power over and above psychological ones, and that psychological factors are strongly, causally related to such measures. But in addition to this, to what extent can we expect that psychological variables in and of themselves have explanatory power beyond any structural variables in explaining social multicultural integration? Within the field of acculturation research no attempt seems to have been undertaken to answer such a question. Based on the notion that acculturation is to a large degree a psychological process, it is expected that psychological variables such as acculturation attitudes are able to provide additional understanding when used in conjunction with sociological variables.

One real-life issue that is relevant beyond all others in the light of the work presented here, and which has received due attention in sociological work, is the presumed inhibitive

influence of group clustering on multicultural integration (e.g. Bolt, Ozuekren & Phillips, 2010). Residential clustering of minorities is perceived as an obstacle to social integration because it reduces the opportunities for contact with outgroup-members. It is often seen as a structural problem, related to socio-economic factors such as level of education, occupational status, income class, and other personal characteristics such as sex, age, length of stay and generational status. But sociological studies have also often included measures regarding people's racial stereotypes, prejudice, and personal preferences about neighborhood composition. It has been found in general that people's willingness to live in an area with a specific ethnic make-up, or one's willingness to have inter-ethnic neighbors is well predicted by one's ethnic attitudes (Charles, 2003).

It could therefore be contended that segregation is self-chosen, and that clustering itself is not the problem, but people's preference to reside with the ingroup is the true cause. As a consequence, simply reducing residential segregation may not be enough to establish multicultural integration, as long as many people are in fact not willing to integrate. However, in line with the "sociological" argument earlier, the simulations have shown that agents who do have a wish for majority contact can become "trapped" inside a minority cluster, and that clustering could thereby reduce opportunities for contact and inhibit integration in addition to self-chosen segregation.

What cannot be ruled out, however, is that the relationship between segregation and integration is spurious, as a result of the influence of the majority group. In the simulations, the majority overall had more impact on the rate of multicultural integration than the minority. It is not hard to imagine that in reality segregation is partly self-chosen, and partly a result of practices of exclusion by the majority. For majority members in real life, preferences regarding residential ethnic composition, and thus housing preferences, are known to be related to ethnic attitudes (Charles, 2003). Moreover, studies carried out in the United States

have shown that discriminative practices by the majority are an important cause of residential segregation (Yinger, 1995). These findings support the idea of an influential majority, and hence make it even more difficult to find out to what extent residential segregation by itself inhibits social integration.

The fact that the findings of the sociological research and the simulation studies point in the same direction is encouraging, but besides the fact that the quick comparisons made here are too general in nature, there are several factors that limit a direct comparison. First of all, the dynamical model deals with social space, not physical space. Residential segregation as a form of clustering is different in the sense that adjacency does not necessarily imply social ties, whereas in the simulations it does. That being said, it is reasonable to assume that there is a relationship between clustering in physical space and clustering in social space, which, at least, makes a comparison between the two phenomena informative.

A second limitation regards the way in which the findings of the simulations and the social studies were compared. Convergence was found on an aspect by aspect basis, comparing the connections between minority preferences and clustering, between majority preferences and segregation, and between clustering and integration separately from each other. In social studies, these relationships have only been investigated separately, making it difficult to draw conclusions about whether residential segregation inhibits social integration in addition to minority and majority preferences (and practices). In the simulations, all these factors were included simultaneously, which makes it possible to compare their relative importance.

The focus of attention in the simulation studies until now has been primarily on the relationships between majority and minority attitudes and integration. Clustering phenomena have been discussed on the basis of visual representations of the simulations, but have not been included as a variable in its own right in explaining integration. In light of the current

discussion, it would be good to look at the simulation results again and see whether clustering has an influence on integration in the simulations, and if it does how large this influence is, compared to the other variables. These outcomes could then be compared to findings related to residential segregation. The expectation is that in line with previous sociological studies, in simulations minority clustering inhibits social integration. Moreover, it is expected that the influence of minority clustering in simulations and minority residential segregation in reality is of comparable magnitude.

The approach of combining variables from different levels of analysis is likely to provide a more fine grained understanding of multicultural integration. The accuracy and the precision of our understanding will depend in large part on the variables we chose to study and include in our analysis however. In the present work, acculturation attitudes have been at centre stage in explaining multicultural integration. The sociological work on residential segregation has included other, but closely related psychological factors, such as prejudice and ethnic stereotypes, in addition to structural variables. All these variables are very useful, but they are also rather general.

Acculturation attitudes are in part determined by people's ethnic attitudes, prejudices and stereotypes (Montreuil & Bourhis, 2001; Zagefka, Brown, Broquard & Leventoglu Martin, 2007; Zick, Wagner, van Dick & Petzel, 2001). However, even though acculturation attitudes include aspects of important related constructs, and are specific to the topic of multicultural integration, one has to wonder if multicultural integration can be sufficiently explained on the basis of these constructs alone. What other variables of importance should be taken into account?

It has been observed that despite the fact that most immigrants favor integration into a new society, there are pronounced differences between minority groups and individuals in the ease with and extent to which they are actually able to integrate socially and culturally. The

fact that Italians would seem to have an easier time integrating into the Dutch society than Moroccans, for example, would hardly surprise anyone and has to be attributed in part to cultural factors rather than motivational ones. It is beyond doubt that the process of adaptation and integration into a society that differs greatly in its fundamental values and practices from one's own provides a much greater challenge than integration into a culturally similar society. The consideration of culture and cultural differences then would seem to offer important additional insight when explaining multicultural integration.

It is somewhat surprising that even though cultural differences or "cultural distance" have been shown to be related to lower levels of adaptation and integration (Furnham & Bochner, 1986; Ward & Kennedy, 1993b), these topics have, besides these and limited other acknowledgments, received relatively little attention in the field of acculturation research. The omission of culture from the acculturation framework has received explicit criticism from Triandis (1997), who suggested that acculturation research should make use of knowledge of dimensions of cultural variation that has been gathered over the past decades.

Indeed it seems that several models of cultural differences could contribute to this discussion. The most comprehensive and well known models are those of Hostede (1980, 2001) and Schwartz (1992), both of which have identified a number of universal cultural dimensions that can be used to distinguish between individuals within groups and between cultural groups or nations. Even though the number of cultural dimensions identified is different for these models, it has been argued that they converge and can be seen as being organized around two dominant dimensions that regard a) egalitarianism versus differences in power/ hierarchy and b) collectivism and conservatism versus individualism and openness (Duckitt, 2001).

These dimensions are theoretically quite well defined, but they are unlikely to be experienced by people directly in daily life in such an abstract way. Rather, it is through

observable variations in beliefs and practices between groups and individuals that cultural differences become apparent. Some of the issues that have been intensely debated in the context of multicultural integration, at least in Western Europe, include the role of women and gender equality, and the importance placed on religion and the role that it should play in daily life and the society in general. Western European countries are democratic, secular, individualistic, and relatively egalitarian, and as a consequence these societies place high value on gender equality and assign relatively low importance to religion, especially in the public domain. That these issues receive so much attention is no coincidence, as they are strongly related to the two main cultural dimensions (Inglehart & Norris, 2003; Inglehart & Welzel, 2005; Norris & Inglehart, 2004).

Given the theoretical and practical relevance of cultural differences for multicultural integration, it would be desirable to investigate to what extent knowledge of people's cultural beliefs helps in explaining their social integration. In line with previous research, it is expected that larger cultural differences are related to lower levels of social integration. Part of this relationship probably involves acculturation attitudes as a mediating variable, but it is expected that culture is an important factor by itself as well.

Hypotheses

1. Minority clustering in simulations and minority residential segregation in reality are both negatively related to multicultural integration, and the strengths of both relationships are of comparable magnitude.
2. Cultural beliefs regarding gender equality and the importance of religion help explain minority social integration beyond structural and socio-economical measures and acculturation attitudes.

3. In addition to structural and socio-economic variables, psychological variables such as acculturation attitudes and people's cultural beliefs help to explain multicultural integration.

Data and methods

To test these hypotheses both simulation and empirical data were required. Because the simulation data that will be used come from the second simulation study reported in chapter 5, the design of this study is not presented separately in this chapter. Instead, these simulations will be presented as one of the sources of data used in the present analysis, and its main characteristics will be summarized later in this section.

With regard to the empirical data needed to test the hypotheses, it is clear that convenience samples cannot suffice to make the required comparisons and analyses. In order to look at the effect of clustering on social integration, for example, data with a high spatial resolution and a relatively large number of participants are needed. Because it is beyond the capacity of the author to set up and conduct such a study individually, archival data were used.

Data regarding minorities were obtained from the 2002 “Social Position and Use of Provisions by Ethnic Minorities” (SPVA2002) survey, conducted by the Social and Cultural Planning office (Sociaal en Cultureel Planbureau), a Dutch governmental institute responsible for research on social and cultural issues. This 2002 study is part of a recurrent series of surveys monitoring minority participation in the Dutch society, carried out approximately every four years among the four largest minority groups in the Netherlands¹: Moroccans, Turkish, Surinamese and Antilleans. These surveys make use of representative stratified

¹ Most of the data gathered in these surveys is made available to researchers through the Data Archiving and Networking System (www.dans.knaw.nl), a cooperative project of the Royal Dutch Academy of Sciences and The Dutch National organization for Scientific Research.

samples of about a thousand participants per group, selected from 13 towns and cities, including the four largest cities in the Netherlands. Participants were personally interviewed by (mostly) bilingual native speakers. The field work was carried out during 2002 and early 2003. This dataset was used for information regarding minorities' social contacts, attitudes, cultural beliefs and structural and background variables such as socio-economic status.

This 2002 dataset also included the four-digit numerical part of the participants' postal code², providing relatively precise information about their neighborhood of residence. This information was then combined with 2003 data provided by the Dutch National Statistics Bureau regarding demographic characteristics of all Dutch neighborhoods. Of specific interest here was the ethnic composition of each neighborhood, with percentages specified for each of the four main minority groups, and for non-Western minorities in general.

Information about majority group attitudes towards minorities were obtained from a 2002 survey on a representative sample of three thousand native Dutch people regarding their beliefs, opinions and attitudes towards minorities and issues related to immigration (Beeldvorming Over Minderheden/ BOM2002), conducted by the Social and Cultural Planning Office.

The choice to make use of these specific datasets is related to the available information contained in each. The latest survey on minorities that is available to researchers dates from 2006, but no longer includes participants' postal code. Detailed data regarding the ethnic composition of neighborhoods is available only from 2003 onwards. The survey regarding Dutch opinions about minorities was conducted in 2002 only.

² Postal codes in the Netherlands consist of six digits: four numbers followed by two letters. The numerical part of the code designates specific neighborhoods; the two letters are assigned to streets or clusters of house numbers in a single street, within specific neighborhoods.

Measures

Minority social integration

In the SPVA2002 survey, three questions concerned contact between minority and majority members and will serve to estimate minority social integration. The questions “Are you visited by (white) Dutch friends or neighbors?” and “Do you sometimes associate with (white) Dutch in your free time?” were coded on a three-point scale with “yes, often”, “yes, sometimes” and “no, never” as answer options. The third question, “Do you have more contacts in your free time with (White) Dutch than with [own ethnic group] or do you have more contacts with [own ethnic group]?” had the following three answer options: “More contact with [own ethnic group]”, “With both equally often” and “More contact with Dutch”. The answers on the three questions were then combined to yield a single score of social integration. The reliability for this scale, as measured by Cronbach’s alpha, was .71.

Minority acculturation attitudes

The SPVA survey did not include items that measured acculturation attitudes directly in terms of willingness for contact with the Dutch and wish for cultural maintenance. However, twelve items measured minority members’ general orientation towards Dutch people. As was shown in chapter four, such an overall orientation overlaps to quite an extent with the contact acculturation attitude. In addition, the SPVA survey included an item inquiring about respondents’ preferences regarding the ethnicity of hypothetical new neighbors, which reflects relative preference for contact. People’s answer to this item, in combination with their general orientation towards the majority, were used as a proxy for the contact acculturation attitude. The survey did not include items that could be used to estimate the

culture maintenance acculturation attitude, and this variable thus had to be left out from the analysis.

The item regarding participants' neighbor preference inquired whether, in case they could choose new neighbors, they would prefer them to be: 1, of the same ethnicity as the respondent; 2, any ethnicity; or 3, Dutch. Participants were asked about their opinion of the Dutch by inquiring to what extent they thought that Dutch people in general are:

- | | |
|--------------|--|
| – Sociable | – Closed |
| – Honest | – Meddlesome/ Interfering/ Intrusive (no |
| – Polite | good direct translation for the Dutch word |
| – Hospitable | “bemoeizuchtig” is available) |
| – Decent | – Stingy/ Miserly |
| – Tolerant | – Distrustful |
| – Helpful | |
| – Friendly | |

Answers were scored on a four-point scale, with the values labeled: 4 “very”, 3 “a little”, 2 “not” and 1 “completely not/ not at all”.

Factor analysis indicated that the items do not belong to a single dimension. Rather, with direct oblimin rotation, a two-factor solution emerged with the four items regarding negative traits—listed on the right side—clearly loading on a different dimension than the eight items regarding positive traits. All positive items loaded primarily on the first factor: the lowest factor loading was .48 (average .61), whereas the highest loading of any positive item on the second factor was .26 (average absolute loadings .13). The negative items loaded mainly on the second factor: the lowest loading was .41 (average .57); the highest loading on the first factor was .27 (average absolute loadings .10).

The eight positive items together formed a reliable scale (Cronbach's $\alpha = .77$), but the four negative items did not combine very well (Cronbach's $\alpha = .42$). As a result, an average score for the eight positive items was calculated for all participants.

Minority cultural beliefs

Six items addressed the issue of gender equality in the SPVA2002. Participants were asked to indicate to what extent they agreed with the following statements regarding family situations:

- It is best if the man/ husband is responsible for finances.
- Education is more important for boys than it is for girls.
- It is more important for boys than for girls that they can earn their own living when they grow up.
- Decisions about large expenses can best be made by the man/ husband.
- The woman/ wife is best responsible for the housekeeping.
- A woman should stop working when she has a child.

Participants could respond on a five-point scale ranging from 1 "entirely agree" to 5 "entirely disagree". These six items formed a sufficiently reliable scale: Cronbach's $\alpha = .76$.

Average scores over these items were calculated, with higher scores indicating support for more equality between men and women.

The importance respondents placed on religion and religious practices was addressed by the next items:

- It is undesirable that one's daughter would like to marry someone of a different religion.
- It is undesirable that one's son would like to marry someone of a different religion.

- It is regrettable that in daily life in the Netherlands religion continues to lose importance.
- Children should attend a school that fits with the religion of their parents.
- If someone does not have long to live and is suffering from pain, she/ he may decide about terminating her/ his life.
- How frequently do you attend religious meetings/ gatherings?

The first five items were answered on a five-point scale ranging from 1 “entirely agree” to 5 “entirely disagree”. The last item was answered on a 4-point scale with the following answer options: 1 “never”, 2 “several times per year”, 3 “several times per month” and 4 “at least once a week”. The last two items were then reverse-coded so that lower scores indicated a stronger emphasis on religion for all items. An average score over the six items was calculated for each participant. Cronbach’s alpha for this scale was .74, indicating an acceptable level of reliability.

Background variables for the minority

Finally, the SPVA2002 survey provided a host of background variables that were included in/ controlled for in the analyses. These variables were the following:

- Sex, coded 1 for male and 2 for female
- Age in years
- Generational status as immigrant: first generation, coded 1, meaning not being born in the Netherlands; second generation, coded 2, meaning being born in the Netherlands, or having immigrated before the 6th year of age.
- Length of stay in the Netherlands. This item was not answered by second generation immigrants. To prevent listwise deletion of second generation immigrants from the analysis, length of stay was divided into intervals, with a dummy variable created for each

interval (value 0 if not belonging to the interval, value 1 if belonging to the interval).

Second generation immigrants would not belong to any of the intervals. The intervals created were, in years: 0-5, 5-10, 10-15, 15-20, 20-25, 25-30, 30-35 and 35+ years

- Level of education. Because of the ordinal nature of this variable, four categories were created according to the maximum attained level of education, which were each turned into a dummy variable. The categories/attained levels of education were: primary school, some secondary school education, but no more than 4 years (typically pre-vocational education), secondary school education until at least 18 years of age (typically education preparing for higher education), and higher education following secondary school.
- Occupational status was coded zero if the respondent had no work and coded 1 if the respondent had work.
- Total net monthly income in Euros. This includes earnings from work as well as any other type of income. It was coded into intervals with dummy variable created for each category. The main reason to dummy-code was to prevent losing a relatively large number of respondents (20%) who did not answer this item. The intervals created were as follows: 0-750, 750-950, 950-1150, 1150-1350, 1350-1550, 1550-1750, 1750-2000 and 2000+ Euros

Because differences in social integration between men and women and according to age are quite possible, the sex and age variables were included to control for any potential bias resulting from these sources. Generational status and length of stay were expected to be quite strongly related to patterns of social integration, and hence needed to be taken into account. Levels of education and income and occupational status together provided an indication of respondents' socio-economic status, which is known to be an important factor in socio-cultural adaptation and were therefore also included in the model.

Minority clustering

Additional non-psychological variables regard the environment in which the respondents lived; the neighborhood. Neighborhood variables were taken from data from the Dutch National Statistics Bureau and coupled to respondents' four-digit numerical part of the postal code as part of the SPVA2002 survey. In general, ethnic minorities tended to be concentrated in urban areas more than in rural areas. Because the effect of ethnic clustering is of specific interest here, a distinction should be made between small scale ethnic clustering (in the neighborhood) and ethnic clustering on a national scale (in urban zones). To control for any difference resulting from ethnic concentration in urban zones, then, the following variables were included as controls:

- Number of inhabitants of place of residence
- Population density of place of residence

Residential ethnic segregation was measured by:

- Percentage of inhabitants in the neighborhood (as determined by the four-digit numerical part of the postal code) belonging to minority's own group
- Total percentage of the neighborhoods' inhabitants being of non-Western origin

Majority attitude towards minorities

The variables listed above together provide the needed information regarding minorities. Information about majority (Dutch) opinions of the minority groups was provided by the BOM2002 survey. Participants were asked about their opinion of Turks, Moroccans and Surinamese by inquiring to what extent they thought that people from these minority groups in general are:

- | | |
|--------------|--|
| – Sociable | – Closed |
| – Honest | – Meddlesome/ Interfering/ Intrusive (no |
| – Polite | good direct translation for the Dutch word |
| – Hospitable | “bemoeizuchtig” is available) |
| – Decent | – Stingy/ Miserly |
| – Tolerant | – Distrustful |
| – Helpful | – Reliable/Trustworthy |
| – Friendly | – Enterprising |

Answers were scored on a four-point scale, with the values labeled: 4 “very”, 3 “a little”, 2 “not” and 1 “completely not/ not at all”.

The eight items on the left are identical to the items that formed the scale assessing minority attitudes towards the Dutch. To make the measured mutual attitudes as comparable as possible, the same items were chosen for the Dutch attitudes towards the minority groups. The average score for each respondent was calculated for the items listed on the left side. Scores were then reversed so that a higher score indicated a more positive attitude. The items listed on the right side were thus not used. (It should be noted that most of the items on the right are also identical to the non-selected items for the minority groups.) The reliability of the scale for Dutch attitudes, reflected by Cronbach’s alpha, towards Turks measured 0.91, towards Moroccans 0.89, and 0.86 when it concerned Surinamese.

The BOM2002 survey did not inquire about respondents attitudes towards Antilleans unfortunately, making it impossible to conduct an analysis including mutual attitudes between the Dutch and Antilleans. A possible reason is that because the number of Antilleans in the Netherlands is much smaller than that of Turks, Moroccans and Suriname, many respondents would have simply no well-formed attitudes and opinions of this group, because of a lack of information.

No information regarding respondents' postal code was registered in the BOM2002 unfortunately (or this information was not made available in the data file). As a consequence, it was not possible to identify which respondents from the majority and minority groups were living in the same neighborhood. As such, the mean attitude of the Dutch population towards each group was calculated on the basis of the information provided, but information regarding individual differences in attitudes of majority members could not be used in the analysis.

Simulation data used to compare to survey data

To make a comparison between simulation results and survey data possible, the simulation data presented in chapter five have to be re-analyzed in a different fashion. In this series of simulations, the mean majority ingroup attitude was 0.50. Mean majority outgroup and minority ingroup and outgroup attitudes were systematically varied using the following values: -0.5, -0.25, 0, 0.25, 0.5. Individual differences were created according to a normal distribution with a standard deviation of 0.35. Each of the simulated conditions was run three times. For more details please refer to the second part of chapter five.

The dependent variable was the extent of social integration between the majority and minority group, which was obtained by comparing the actual extent of contact between the groups with the extent of contact that would be expected on the basis of randomness. In a perfectly integrated multicultural society, ethnicity should not be an issue in interpersonal contacts and thus contacts between the groups should be random when it comes to group membership. Deviations from randomness can then be used to calculate an index for integration. This index has a value of zero in the case of total segregation — no contacts between the groups — and a value of 1 for perfect integration, or a random distribution of contacts.

Specifically for this analysis, in addition to acculturation attitudes, the crucial independent variable of minority clustering was needed. Minority clustering was quantified in a way analogous to social integration between the groups: the extent of ingroup contact was compared to what would be expected on the basis of pure randomness. This comparison resulted in a value of one (total clustering) in the case of exclusive ingroup contact and a value of zero when contacts were made according what would be expected on the basis of randomness. Group clustering is not just the inverse of intergroup contact, because a minority agent can for example choose not to have contact with ingroup members while being excluded by the majority; this would be related to both a low extent of contact between groups, and a low level of clustering. Both measures are to some extent negatively correlated though.

Results

The survey data and simulation results will be analyzed using multiple linear regression models. As most of the research questions pertain to the explanatory power of specific variables in addition to a set of other predictors, the main statistic of interest in this analysis is R-squared change, which indicates the additional percentage of explained variance resulting from the inclusion of specific additional variables. Specific beta values of individual variables are of less interest.

To estimate the importance of the effect of minority group clustering on multicultural integration in the simulations, the extent of integration between the groups was regressed on the majority and minority acculturation attitudes, and on minority clustering. Because the question of interest regards the extent to which minority clustering is implied in preventing intergroup contact over and above self-chosen clustering and social exclusion by the majority, acculturation attitudes were entered in a first step, and minority clustering in a

second step. The amount of explained variance uniquely attributed to minority clustering in this analysis is represented by R-squared change of the second step.

Table 1 displays the results of the analysis and shows that acculturation attitudes explain 96% of the variance of the social integration between the groups and that minority clustering explains an additional 1.5 percent. The inhibition of social integration that can be uniquely ascribed to minority group clustering is thus relatively small in these simulations, but as hypothesized, not zero. The beta-value connected to minority clustering in the second model is relatively large, but the estimation of the size of this effect also includes minority clustering that is a direct result of acculturation attitude, i.e. self-selected segregation, and exclusion. These results are not consistent with the idea that minority clustering itself is an important factor that stands in the way of social integration between groups, as has been sometimes suggested by social research.

Table 1

Two multiple linear regression models predicting social integration on 1) the basis of majority and minority outgroup attitudes and minority ingroup attitude, and 2) on the basis of the basis of majority and minority outgroup attitudes, minority ingroup attitude and minority clustering

Model	Predictors	β	Sig. β	R ²	R ² -change	Sig. R ² -change
1	Attitude majority to minority	.825	.0001	.960	.960	.001
	Attitude minority to majority	.481	.0001			
	Attitude minority to own	-.217	.0001			
2	Attitude majority to minority	.630	.0001	.975	.015	.001
	Attitude minority to majority	.344	.0001			
	Attitude minority to own	.052	.01			
	Minority Clustering	-.381	.0001			

It was hypothesized that comparable results would be obtained from an analysis of the survey data. To answer this question, a regression model was constructed that has the three-item measure of the extent of social contact of minorities with majority members as dependent variable. In order to ensure the isolation of the relationship of residential segregation with social integration as much as possible, all other predictive variables relevant

to the analysis were entered before the measures of residential segregation were added. As a result, this regression model also includes the variables needed to answer the other hypotheses.

For reasons of ease of presentation, the model will be described in a step by step fashion, in line with the order in which the variables were added. Because it is most natural to discuss the relevance and importance of the variables at the point they appear in the model, the second part of the results pertaining to the hypothesis regarding minority clustering will be presented last. This means that the answers to the other hypotheses will be discussed first.

The first block of variables entered into the model contains the personal background variables: Sex, age, generational status and the length of stay categories. Also included in this block are the control variables regarding urbanization: number of inhabitants and population density of place of residence. The second step of the regression contains information regarding socio-economic status. Variables added here are the categorical variables measuring level of education, income and employment status. All the variables listed so far serve as control variables in this analysis, and all are structural/ sociological.

Next, the minority orientation towards the Dutch was entered. At this point the analysis includes those variables –besides a measure of residential segregation itself–that have been regularly included in studies on the relationship between residential segregation and social integration. The amount of additionally explained variance by the variables entered in subsequent steps will now show to what extent these models can still be enriched to provide a more complete understanding of the issue.

Because the simulations appointed such high importance to majority attitudes, this variable was chosen to be added next. It was expected that knowledge of people's cultural beliefs further increases our understanding of social integration, and therefore minority scores

on the gender equality and importance of religion scales were entered in the model in the subsequent block. Finally, the measures of residential segregation were entered into the model.

The results of the analysis are presented in Table 2. The beta-values shown in the table are those connected to the complete, seventh model, whereas the R-squared numbers are shown for each block. Overall the model was able to explain just over 34 percent of the variance of social integration, which is quite high considering the fact that these results are based on survey and not experimental data and that multicultural social integration is a complex issue.

The structural and socio-economic control variables that were entered in the first three blocks together account for just over 22 percent of the variation of social integration.

The block containing the socio-economic measures, with 11 percent, accounts for half of this number. The level of education seems to be strongly implicated, with high negative beta values for the lowest level of education and increasingly more positive betas for the higher categories of education; a lack of education thus seems to inhibit social integration, whereas higher levels of education promote it. A similar though less pronounced trend can be observed when it comes to height of income. The level of urbanization of the place of residence accounts for 5 percent of variation of social contacts; mainly captured by the number of inhabitants, not by the population density. Living in (big) cities is related to a reduced level of social integration. Of the personal background variables, which accounted for about 6.5 percent of variation in social contacts, length of stay proved to be most influential, showing that, non-surprisingly, increased length of stay is related to increased social integration. Also, being born in the Netherlands is related to a higher level of social integration, which is not surprising either.

Variables related to people's attitudes, orientations and cultural beliefs were entered into the model in the three subsequent steps, and together accounted for about 10 percent of explained variance. The hypothesis that psychological variables, when combined with sociological variables, increases our understanding of multicultural integration is thus confirmed.

Minority attitudes towards the majority were entered first, in block four, and explain an additional 4 percent of variation compared to the controls. Consistent with previous findings, positive attitudes towards the Dutch are positively related to the amount of contact. The beta value related to minority attitudes towards the Dutch is one of the highest in the model, indicating that this is a relatively important variable. Majority attitudes towards minorities, entered in step 5, accounted for about another 2.5 percent of variation; decidedly lower than the amount of explained variance by the minority attitudes. Again, more positive attitudes were related to higher levels of contact, as was found in previous studies. Also the beta-value of this variable was only about half of the one of minority attitudes: .083 compared to .157, respectively. These results are the reverse of the pattern of outcomes from the simulations, in which the impact of the majority outgroup attitude was shown to be twice as influential as the minority outgroup attitude.

The inclusion of measures of minority cultural beliefs in step six added still another 4 percent of explained variance in social integration to the overall model, over and above that what already was explained by the variables in earlier steps. Looking at the beta values of these variables, one can see that cultural beliefs are among the most influential of all variables in the model, with the importance of religion scale having in fact the highest beta value of any variable: .163. The questions of whether culture plays a role in social integration, and if adding measures of cultural beliefs enriches our understanding of social integration of minorities have to be answered with a "yes".

The way in which cultural beliefs are related to social integration are in line with what would be expected. The Netherlands is a modern, post-industrial, secular country where high emphasis is placed on gender equality. Lower scores on the importance of religion and gender equality scales would indicate a more conservative outlook on life, in comparison to the Dutch norms. Lower scores thus indicate greater cultural differences between minority members and the majority. Cultural differences are expected to inhibit social integration, and that is precisely what is observed in this analysis.

Table 2

Multiple linear regression model predicting minority social integration on the basis of structural and socio-economic variables, on minority and majority mutual attitudes, minority cultural beliefs and minority residential segregation

Model	Predictors	β	Sig. β	R^2	R^2 -change	Sig. R^2 -change
1	Sex	.022	.245	.064	.064	.001
	Age	-.047	.065			
	Generation	.068	.091			
	Length of stay 0-5y	-.073	.009			
	Length of stay 5-10y	-.043	.204			
	Length of stay 10-15y	-.023	.585			
	Length of stay 15-20y	-.007	.837			
	Length of stay 20-25y	.021	.656			
	Length of stay 25-30y	.040	.412			
	Length of stay 30-35y	.015	.710			
	Length of stay 35-99y	.076	.019			
2	Number of inhabitants	-.109	.000	.113	.049	.001
	Population density	.014	.655			
3	Has work; no/yes	.018	.426	.222	.109	.001
	Primary education	-.136	.040			
	Some secondary education	-.024	.658			
	Complete secondary education	.022	.700			
	Higher education	.059	.156			
	Income 000-750 €	-.043	.037			
	Income 750-950 €	-.036	.074			
	Income 950-1150 €	-.022	.273			
	Income 1150-1350 €	.014	.511			
	Income 1350-1550 €	-.009	.669			
	Income 1550-1750 €	.005	.788			
	Income 1750-2000 €	.018	.329			
	Income 2000-9999 €	.037	.055			
4	Minority attitude to Dutch	.157	.000	.263	.041	.001
	Minority neighbor preference	.058	.001			
5	Dutch attitude to minority	.083	.000	.285	.023	.001
6	Belief in gender equality	.112	.000	.326	.041	.001
	Importance placed on religion	.163	.000			
7	% ingroup in neighborhood	-.095	.000	.342	.016	.001
	% minorities in neighborhood	-.065	.029			

Finally, in the seventh and last step, the measures of residential segregation were entered into the model. As with the simulation results, clustering accounts for an additional 1.5 percent of variation. It has to be noted that the absolute amount of additional explained variance is the same in both analyses, but the amount of relative explained variance of the measures of segregation (compared to the total amount of explained variation by the model it belongs to) is actually higher in the present analysis. Minority segregation thus seems to be a stronger obstacle to social integration than the simulations leads one to believe. The expectation that the strengths of the relationships between residential clustering and minority clustering in the simulations would be about equal is thus not entirely supported.

Because two measures of minority segregation were entered in block seven, something more can be said about its effect. Both the extent of ingroup clustering and overall minority clustering are related to lower levels of social integration. The measure of minority clustering in general is essentially a measure of the relative absence of majority members in the neighborhood. If this measure had not been significant but ingroup concentration were, then this would have been an indication of a specific ethnic segregation phenomenon in which a lack of social integration with the majority is a consequence of predominant ingroup socializing. This however does not seem to be the case, because it is not just the presence of ingroup members that predicts absence of contact with the majority, but it is the absence of majority members that is related to a relative absence of social integration.

Still, as in the simulations, the extent to which residential clustering stands in the way of social integration seems to be fairly limited in this analysis. However, it could be that the strength of the relationship is underestimated in this model because the degree of urbanization was entered as a control and minorities are overrepresented in the largest cities in the Netherlands (the population of the four largest cities in the Netherlands –each included in this analysis–consists in 30 percent of non-western immigrants, compared to a national

average of 10 percent). Therefore, by controlling for urbanization, the relationship between clustering and social integration is likely to have been attenuated. The extent to which this is the case can be checked by re-running the analysis leaving out the measures of urbanization.

In analogy to the relationship between clustering and social integration, the strength of the relationship between personal attitudes and beliefs on the one hand and social integration on the other is probably underestimated in this analysis because so many control variables were included. The level of education attained, for instance, has an impact on social integration in an indirect way. Higher levels of education may make it easier to find work and so help social integration. Because education is related to cognitive development and so impacts one's thinking and convictions, it is likely related to the attitudes and cultural beliefs that play a role in social integration.

Similarly, as discussed previously, the majority attitude to a minority does not only impact social integration directly, but, if negative, also has inadvertent effects on levels of education of minorities, and the opportunities minorities have on the job market and housing market, for instance. The real total impact of majority attitudes is thus unlikely to be sufficiently reflected in this analysis by the majority attitude term.

To explore the impact of the dependencies discussed in the previous two paragraphs, the analysis will be repeated leaving out, first, the items related to work and income, and then also the items regarding education. The reason for this order of steps is that education influences work and income, and if education were removed first its impact would still be expressed partly through work and income. First, however, in order to estimate the influence of residential segregation without the control of urbanization, the model will be re-run leaving out the variables of number of inhabitants and population density of the place of residence.

Table 3 contains all three re-modeled analyses. Column A displays the analysis in which the urbanization controls are left out, and which is thus most similar to the initial analysis presented in Table 2. In the analysis in column B, the variables related to income and work are additionally left out, and in the analysis presented in column C, education is omitted.

The reason to reanalyze the data without measures of urbanization related to the fact that because minorities are more concentrated in cities, controlling for urbanization could lead to an underestimation of the importance of residential segregation at the neighborhood level. The differences in outcomes between the models in Table 2 and in column A of Table 3 are congruent with this idea. The overall amount of explained variance decreased only a little when urbanization variable were removed; from .342 to .335. The variance previously explained by urbanization is now explained for the largest part by residential segregation. The amount of additionally explained variance of that block increased from .016 to .034, and the importance of absence of majority members, indicated by the overall percentage of minorities in a neighborhood, has especially increased. This is indicated by a change in the beta value of this variable from -.065 to -.121; the largest change in beta of any variable. It thus seems that minority residential segregation may have a larger impact on social integration than what would be presumed on the basis of the previous analysis, and on the basis of simulation outcomes. However, this effect seems not to result because of mere ingroup-clustering, but of the relative absence of majority members, i.e. concentrations of minorities of different ethnicities together.

The models in columns B and C were constructed to gain some insight into the relationships between majority and minority attitudes on the one hand, and socio-economic measures on the other. Measures of urbanization were not included in these models, so the model presented in column A will serve as reference point in the following interpretation.

Table 3

Three multiple linear regression model predicting minority social integration on the basis of structural and socio-economic variables, on minority and majority mutual attitudes, minority cultural beliefs and minority residential segregation

Model	Predictors	A			B			C		
		β	Sig. β	R ² / R ² -change	β	Sig. β	R ² / R ² -change	β	Sig. β	R ² / R ² -change
1	Sex	.014	.460	.064/.064	-.012	.511	.064/.064	-.037	.006	.064/.064
	Age	-.051	.046		-.067	.007		-.112	.037	
	Generation	.069	.089		.066	.106		.072	.000	
	Length of stay 0-5y	-.071	.010		-.077	.005		-.073	.080	
	Length of stay 5-10y	-.043	.201		-.044	.199		-.047	.010	
	Length of stay 10-15y	-.023	.599		-.021	.617		-.020	.171	
	Length of stay 15-20y	-.008	.824		-.008	.828		-.017	.639	
	Length of stay 20-25y	.026	.594		.027	.566		.019	.639	
	Length of stay 25-30y	.041	.401		.044	.373		.029	.691	
	Length of stay 30-35y	.016	.680		.016	.679		.014	.562	
	Length of stay 35-99y	.076	.019		.073	.024		.077	.733	
2	Has work; yes/no	.019	.407	.183/.119			.167/.103			
	Primary education	-.127	.056		-.131	.049				
	Some secondary education	-.020	.720		-.017	.759				
	Complete secondary education	.027	.630		.039	.488				
	Higher education	.058	.161		.081	.049				
	Income 000-750 €	-.037	.068							
	Income 750-950 €	-.029	.146							
	Income 950-1150 €	-.019	.339							
	Income 1150-1350 €	.021	.324							
	Income 1350-1550 €	-.003	.898							
	Income 1550-1750 €	.007	.698							
3	Minority attitude to Dutch	.165	.000	.234/.051	.161	.000	.218/.051	.157	.000	.120/.056
	Minority neighbor preference	.064	.000		.063	.000		.064	.000	
4	Dutch attitude to minority	.088	.000	.261/.027	.099	.000	.253/.035	.141	.000	.198/.078
5	Belief in gender equality	.108	.000	.301/.040	.112	.000	.295/.042	.152	.000	.265/.067
	Importance placed on religion	.163	.000		.164	.000		.183	.000	
6	% ingroup in neighborhood	-.083	.002	.335/.034	-.080	.003	.330/.034	-.067	.014	.304/.039
	% minorities in neighborhood	-.121	.000		-.124	.000		-.147	.000	

In column B measures of work and income were omitted, and this had only a small effect on the overall explanatory power of the model; it decreased explained variance by half a percent, from .335 to .330. The explanatory power (R²-change) of block two, from which those variables were dropped, decreased from .119 to .103, which is larger than the decrease in overall explanatory power. The reason is that some predictors have become more important, now explaining part of the variance previously explained by work and income. As expected, the Dutch attitudes towards the minority have become more important as a

predictor and explain some of the variance previously explained by the work and income related variables, as can be seen both in the larger beta value and larger R^2 -change value related to this variable. Also age has become a more important predictor overall, as can be concluded from its more extreme beta value. This indicates that age is negatively related to the probability of having a job and height of income. Other variables seem to have been relatively unaffected by removing work and income from the model, as their beta values are nearly identical in both models, and also the R^2 -change statistics connected to the different blocks are nearly the same.

If education is dropped from the analysis as well, the model changes more severely and looks as displayed in column C. The explanatory power of the model decreases from .330 to .304; a loss of about 2.5 percent explained variance. More variables are affected by the current change compared to the previous change, showing that education is an important variable and related to many aspects of social integration in an indirect way.

The importance of Dutch attitudes towards minorities increased further; beta jumped from .099 to .141 and the amount of explained variance of the variable at the moment it is introduced into the model now measures nearly 8 percent, compared to 3.5 percent in column B. Also age again became a stronger predictor, indicating that older immigrants on average have lower levels of education. Gender reached significant levels as a predictor, with being male predicting lower levels of contact. Surprisingly, and differently than expected, the importance of minority attitudes towards the Dutch did not change much as a predictor. This suggests that there is only a weak relationship between minority attitudes and socio-economic variables.

Cultural beliefs of minorities gained in prominence as predictors however. The beta of gender equality jumped from .112 to .152 and the predictive power of the importance of religion increased from .164 to .183. The amount of additional explained variance of these

variables increased to over 6.5 percent, from being just over 4 percent previously, in model B. This result indicates that, as expected, levels of education are related to cultural beliefs. Finally, also the importance of minority clustering further increased overall, and the relative importance of the absence of majority members especially gained in importance compared to the concentration of ingroup minority members. It thus seems that a relationship exists between residential segregation and level of education, and that this relationship also covers the possible effects of income and work on residential segregation.

Concluding discussion

After comparing the importance of minority clustering in the simulations and minority residential segregation in the Netherlands, it is clear that group clustering is more of an impediment to social integration in reality than is predicted on the basis of simulations. In the simulations, social clustering was predominantly self-chosen by the minority or a result of exclusion by the majority, and therefore there was little impact of clustering on social integration that could not be explained in terms of majority and minority attitudes.

Many previous investigations of the relationship between residential segregation and social integration of minorities have only partly explored the possibility that segregation is self-chosen or enforced, by only including a limited set of variables. In the present analysis, several variables were included that were identical, or closely related to those in the simulations and that were typically not considered in earlier investigations. The inclusion of minority attitudes towards the Dutch, their neighbor preferences and measures of their cultural beliefs made it possible to be more sensitive to possible self-chosen segregation. By including the Dutch attitudes towards the minority groups, the analysis became sensitive to possible majority influence.

The result is that despite all these controls, residential segregation still turns out to be negatively related to social integration. Even if residential segregation were self-chosen or enforced, this does not completely explain the lower extent of social integration that goes hand in hand with living a neighborhood with a high concentration of non-western immigrants. This is a strong indication that minority clustering by itself is an impediment to social integration. It is not the presence of a large percentage of co-ethnics that lies at the basis of this relationship though, but rather the relative absence of members of the majority.

What should be kept in mind however is that residential segregation is by no means the most important variable in explaining social integration. When taking into account personal characteristics, attitudes and beliefs, and socio-economic factors, it only accounts for a tenth of the total explained variance in social integration, and this number is based on the analysis in which the controls for urbanization were not included. It was observed that when measures of urbanization were dropped from initial model, the importance of residential segregation increased; in fact doubled. This is an indication that the “problem” of minority clustering may actually not just lie at the neighborhood level, but is related to the fact that the concentration of minorities is high in cities in general. This in turn is of course related to the overall number of minorities in a country.

Bringing together sociological and psychological variables in a single model was instrumental in checking whether residential segregation is self-chosen and imposed, but it also shed light on several additional questions. First of all, the analyses showed that the percentage of explained variance in social integration goes up substantially when psychological variables are added to structural measures. This indicates that even for descriptive purposes, any purely sociological model could be enriched to represent reality in more detail. More importantly however, these analyses with combined variables help us to better understand the factors that drive multicultural integration.

The addition of measures of minority cultural beliefs in particular turned out to be informative. The results showed that, as expected, the more conservative a person's cultural views, the lower the extent of social contacts with the majority group. Even though the amount of variance uniquely shared between the measures of cultural beliefs and social integration was fairly limited, judged on the basis of the size of the beta values of these cultural variables in the model, they were among the most influential.

These beta values did not change in response to deleting economic measures from the model, but increased substantially when in a next step measures of education were also dropped, indicating that minority cultural beliefs and levels of education are likely to be quite strongly linked. This suggests that education is an important factor in determining people's outlook on life, and that lack of education probably makes it difficult for minorities to adapt to and integrate into the Dutch society.

A second variable that responded strongly to omitting education, but much less so to dropping economic measures, was the majority attitude towards the minority. This relationship can either be interpreted as the majority preventing minorities from attaining high levels of education, or minority education being a factor in determining majority attitudes. It has been convincingly shown how majority prejudice can inhibit minority educational success (Hurtado, 2004; Hurtado & Carter, 1997; Kao & Thompson, 2003; Ogbu, 1978, 1990). But in the present case, most respondents were not born and primarily educated in the Netherlands, and this explanation can thus to a large degree be ruled out. These results suggest that the Dutch have a more negative opinion towards the lower educated, which may partly impact minority social integration because of the Dutch avoiding contact.

If we combine the interpretations presented in the two preceding paragraphs, however, it seems much more plausible that low levels of education are related to conservative cultural beliefs, something which has been observed in previous research (Scheepers, P., Te

Grotenhuis & van der Slik, 2002), and that these cultural differences lie at the basis of Dutch opinion formation. After all, a level of a person's education cannot be directly seen, but expressions of cultural beliefs are much more readily observable. Especially the cultural variables addressed in this analysis have a relationship to (publicly) observable signs in terms of dress, social behavior, interactions between men and women, church going, etc.

Minorities' wishes for culture maintenance could not be addressed in this analysis because of a lack of items that could be used for their measurement or estimation. It seems likely though that cultural differences are also related to this issue. The larger the differences between one's own cultural beliefs and the majority culture, the more of a fundamental shift in values would be required in order to culturally adapt. With a large cultural "gap" minorities might see the differences as increasingly irreconcilable, preferring to maintain their own culture instead.

Even if minorities try to adapt to the majority culture, this does not have to be perceived as such by the majority. It has been shown for instance that Dutch people generally misperceive Turkish and Moroccan immigrants as preferring segregation, while these minorities predominantly favor integration (van Oudenhoven, Prins & Buunk, 1998). The authors were sensitive to the importance of this observation, but could not provide a clear explanation why it should exist. A possible explanation is that cultural differences lie at the basis of this finding. The majority may well judge the extent to which minorities make an effort to adapt on the basis of how culturally similar they perceive minorities to be to themselves. Any perceived large deviation from the majority cultural standard is then interpreted as a lack of (willingness for) adaptation, irrespective of the true minority attitudes and efforts. Attempts and willingness to adapt may thus simply not be recognized because minorities may still be culturally so different from what is considered to be "normal" by the majority.

The study also showed that such (mis)appraisals negatively impact majority reactions towards minorities (van Oudenhoven, Prins & Buunk, 1998), potentially becoming a source of negative feedback to minorities despite their intentions and attempts to adapt. As such, it may not just be the compatibility of acculturation attitudes that is an important determinant of the course of multicultural integration as Bourhis and colleagues suggested (1997), but also, or even in particular so, the mutually *perceived* acculturation strategies.

All these considerations point towards culture as a factor of major importance in multicultural integration. If, as suggested, cultural differences lie at the basis of majority attitudes towards minorities and minority attitudes towards culture maintenance, then our understanding of acculturation could be greatly enhanced. It is thus imperative, as Triandis (1997) already indicated more than a decade and a half ago, that we look at the role of culture and try to position it within a larger explanatory framework of acculturation.

The implications of these findings might seem to be broad and important, but the nature of the data and analyses only allow drawing conclusions very tentatively. First of all, the data is cross-sectional and the analysis correlational, which prevents making any conclusions about causality. A second issue is related to the fact that variables and items were used that happened to be present in the questionnaires. There is no guarantee that important variables were not omitted, and that as a consequence the results provide an incomplete or biased picture. Third, the method of observing changes in a model by step by step dropping some variables is interesting from an exploratory point of view, but it does not allow good insight into the precise relationships between variables. Even if the interpretations provided have high face validity, more complex types of analyses such as structural modeling are needed to map these relationships in a more reliable way. Fourth, the data have a hierarchical structure; people live in neighborhoods, which are part of larger definable urban areas, which are again

nested in a cities and towns, etc. Hierarchical or multilevel models would do better justice to this type of data, resulting in more accurate and refined conclusions.

Finally, the dependent variable of social integration maintains a reciprocal relationship with minority attitudes towards the Dutch. This violates the principle of non-recursivity and as a consequence the regression models may yield biased results. Technically, in such cases of endogeneity, the relationship of a predictor A with a dependent B could take on any form, and thus be entirely unreliable. What likely happened in the present analyses is that because contact partly influences minority attitudes and these attitudes are in turn used to predict contact, the resulting self-explanatory loop causes the importance of attitudes as a predictor of contact to be overestimated leading to inflated beta-values. It can be safely assumed however that the true causal relationship partly flows from attitudes towards contacts, as this has been established by previous research (Binder, et. al., 2009; Eller & Abrams, 2003; Herek & Capitanio, 1996; Levin, van Laar & Sidanius, 2003; Pettigrew, 1997). The true predictive power of minority attitudes to contact is thus not zero or negative but it is certainly smaller as depicted in the regression models.

A different sort of limitation of the present research effort that has become apparent is the difficulty of directly comparing simulation results to real life societal data. In the present investigation, results from simulations and surveys could only approximate each other very coarsely. Clustering in the simulations represents segregation in social space for instance, whereas the societal counterpart was physical, residential segregation. Also the attitudes of the majority and minority did not have identical meanings in the simulations and the regression models. This attempt at combining data typically gathered by different research disciplines should be seen as a first exercise therefore; a starting point.

Several things can be done to facilitate more insightful comparisons in the future though. The simulation model should be expanded if it is to more accurately represent real

societal processes. These expansions need to be based on theoretical notions, some of which might be obvious and can be readily adopted; others however may not be all that clear yet and might be the result of further theoretical developments. A second way by which comparisons could be improved is by gathering data that more closely respond the needs of the analysis. It would be very helpful if conceptually the simulation and empirical data are as similar as possible. This may not prove to be easy, as ideally the empirical data is large scale, longitudinal and socially intimate, which likely makes the collection procedure relatively intrusive and expensive.

Something that could help to increase our understanding of multicultural integration more generally is a pooling of knowledge and research efforts from different scientific disciplines. Multicultural integration is complex, and it is unlikely that a single approach can sufficiently capture it or that a single researcher will gather all relevant knowledge. It would be interesting therefore to see the results of a dynamical model constructed by a group of researchers from all the different social sciences.

Chapter 8

Conclusions

In this dissertation, the conception, development, simulation and empirical testing of a dynamical model of multicultural integration were presented. The main reason that this model was conceived was to shed light on the dynamical social processes by which the beliefs and behaviors of individual people over time come to shape complex patterns of social relations in culturally plural societies. The present research has shown that the dynamical approach makes it possible to investigate such social dynamic processes, and that computer simulation is a useful tool for this.

The objective was not to create a virtual reality that resembled the real world as closely as possible. In line with the principle of dynamical minimalism (Nowak, 2004), the objective was to create a simulation program in the simplest way possible that was sufficiently complex to provide new insights into multicultural integration. After the basic assumptions of the model were tested with the help of simulation results and empirical data, the model was made gradually more complex and more realistic. At each step, a simulation study helped analyze the properties of the model.

Berry's model of acculturation was used as the basis to formulate the dynamical model of multicultural integration. Berry's acculturation attitudes served as the central variables: minority attitudes towards the majority and towards their own group were assumed to motivate them members to seek or avoid contact with members of both respective groups. Because of some conceptual questions that came up when interpreting Berry's majority acculturation attitudes, they were not adopted into the model in their original definition.

Instead, the majority was assumed to have an attitude towards contact with the minority, along the same lines as the minority outgroup attitude.

Next, computer simulations helped to test the model's internal validity and to find initial confirmation that the model behaved in accordance with expectations and known empirical findings. These simulation outcomes were reported in chapter 3 and showed that on those points where the dynamical model and Berry's model conformed, the simulation results fit the patterns of known findings. On other points, where the dynamical model's formulation deviated from Berry's, the results were primarily consistent with the dynamical model's assumptions. The computer simulation outcomes suggested, for instance, that multicultural integration might be better understood if continuous acculturation attitudes are used instead of categorical acculturation attitudes.

Even though simulations helped to provide clues regarding some assumptions and issues that came up during model construction, others could only be resolved by empirical testing. Hence, the next step was to find empirical support for the model's most important principles: the relationships between acculturation attitudes and social contacts. The comparison of Berry's majority acculturation attitudes to the alternative conception adopted in the dynamical model was of specific interest. Using samples of majority and minority members, both conceptions were investigated. The results provided support for both the doubts about the original formulation of the majority acculturation attitudes, and for the proposed alternative: Berry's attitudes were hardly related to social contact with minorities, whereas a more general majority attitude towards the minority was positively related to such contacts. For the minority it was found that, as expected, both acculturation attitudes were positively related to social contact with their respective groups.

In addition to providing some necessary support for the dynamical model's assumptions, the analyses of the relationships between the majority and minority attitudes

and social contacts lead to a more general discussion of the role of acculturation attitudes as explanatory variables in multicultural integration. Because attitudes were observed to be primarily related to contact quality and not to contact quantity, this revealed that they are foremost an outcome of social interaction, rather than a cause. In addition, the patterns of relationships between the respective attitudes and contact with members of the group they concerned were different. This raises the question whether the goals and motivations for minorities to have contact with ingroup and outgroup members might be different.

A partial reason may be related to the fact that acculturation attitudes do not seem to be unitary constructs. Minority acculturation attitudes always regard cultural adoption in conjunction with a wish for social contact, for instance. Could it be that to some degree these factors are better considered separately? For utilitarian reasons such as economic gain or education, it might make sense for minorities to get in contact with the majority. Does this necessarily entail that they also prefer to adopt majority culture though? Cultural adoption might be related to utilitarian reasons, but it seems also to be related to issues of identity, cultural beliefs and religion. A similar argument can be made with regard to culture maintenance and ingroup contacts.

For dynamical modeling, causes and effects need to be clearly separated, although they may be reciprocally linked through interaction over time. Seeking, maintaining and avoiding contact are key behaviors in the dynamical model. Acculturation and intergroup attitudes likely do motivate these behaviors to some extent, but it seems unlikely that they entirely explain them. Possibly, a more complete understanding could be obtained if some of people's beliefs, goals and motivations were included as explanatory variables.

Now that support was found for many of the dynamical model's assumptions, several series of simulation studies were conducted to investigate the processes underlying

multicultural integration. These simulations provided the opportunity to gain insight into how these processes might unfold over time. The first series of simulations, described in chapter 5, had the aim of looking at integration between groups in the way that Berry's model has most often been used: to look at groups' average acculturation strategies and relate these to overall levels of social integration. In these simulations, average group attitudes were assigned different values, and systematically combined so that the entire range of possibilities would be analyzed. Because this study aimed to understand the phenomenon at the group level, no individual differences were assigned to agents in the simulations; groups were thus homogeneous.

Many outcomes were in line with intuitive expectations; mutual negative attitudes lead to segregation, mutual positive attitudes to integration. Other results were rather surprising. Tolerance for instance, often presented as the panacea to problems of multicultural integration, turned out not to be related to high levels of integration at all. In fact, rather the opposite result emerged. With two mutually tolerant groups, who had positive ingroup attitudes, the resulting state of the society was near-total segregation. Even when the majority was tolerant, and the minority has a moderate wish to integrate into the majority society –thus having a positive attitude towards the majority– very low levels of integration resulted. If anything, these results indicate that mere tolerance is an obstacle to multicultural integration rather than a solution. In more general terms, in these simulations the majority attitude towards the minority was the key to social integration, and as long as this attitude is not positive, high levels of social integration will not take place.

An important shortcoming of the previous analysis is of course that groups were regarded to be homogeneous. Trying to understand patterns of social integration based on group level characteristics has been a limitation in much theorizing about multicultural integration. That is has proven to be difficult to go beyond this general level is not so

surprising, because with most models it is hardly possible to look at the micro and the macro level at the same time. So even though it was a logical step to include individual differences in the dynamical model at this point, this step was very non-trivial.

The second simulation study reported in chapter 5 assigned attitudes to individual agents according to a normal distribution, based on the same conditions as in the previous simulation study, i.e. the same mean group attitudes. The differences between the outcomes of both studies were of particular interest in the analysis of the results. Three main differences were observed.

The first difference was that the relationships between the groups' attitudes and the extent of social integration turned out to be linear, whereas in the previous series these relationships were severely non-linear. The attitude of the majority towards the minority turned out to be the most influential variable in the model, which was in accordance with the results of the previous simulations.

A second difference regarded the emergence of social structure in the social space. Agents of the same group who had similar outgroup attitudes tended to cluster together. This was a surprising result because no mechanism was included in the model's formulation that made agents select their social contacts on this basis. This social structure was thus a sort of by-product of agents' motivation to select contact on the basis of other criteria. Assuming that social integration in part takes place through social networks, the structure of these networks is likely to be relevant.

The third and last important difference concerned the identification of small numbers of potentially influential agents. In accordance with the fact that social space was structured as a function of agents' attitudes, the simulations showed that agents with particular attitudes often ended up occupying specific places in the social system. By making analogies with reality, it was theorized that some of these agents might play important roles in determining

the development of the future course of the social system. Two types of agents in particular attracted attention.

In situations characterized by patterns of overall segregation between the groups it was observed that even though most agents of each group had mutually negative attitudes, a small number of agents harbored positive feelings towards the other group. Often, some of these agents established contact with each other, and thus formed a connection between two otherwise separate groups. It has been observed that such a form of bridging social capital can be crucial in the containment or resolution of (looming) intergroup conflict (Varshney, 2001).

The second type of potentially influential agents concerned those who became marginalized –disconnected from both groups– as a result of their negative ingroup and outgroup attitudes. Because marginalized minority agents react negatively to social interactions with others, they can only have a negative impact on the social system in the long run. In reality it has been found that minority marginalization has been linked to delinquent behavior (Emler & Reicher, 2005), street gang membership (van Gemert, Peterson & Lien, 2008) and radicalization and extremism (Post, 2005; Sageman, 2004; Smelser, 2007). In addition to the direct negative impact of marginalized individuals' (inter)actions, they also tend to attract a disproportionate amount of attention and thereby have a relatively strong negative impact on other people's opinions, which might lead to a further deterioration of intergroup relations.

Despite the fact that it was a small step logically to consider individual variations in attitudes in conjunction with group averages, the overall result of these simulations was that a much more fine-grained picture of social integration emerged. On one hand, the overall pattern of relationships between the main variables (attitudes) and social integration became easier to interpret as they assumed a linear shape. On the other hand, the simulation outcomes

provided a relatively detailed view of how agents acted and interacted locally and were responsible for the formation of social structure within the larger social system. In addition, for some agents potential meaning could be assigned to their “role” within the system at large, analytically bridging the gap between the micro and the macro level.

At this point the properties of the dynamical model were extensively analyzed by simulating how ongoing social interactions shape patterns of multicultural integration. The model did fall short of representing reality accurately, however, because agents’ attitudes remained fixed during the course of a simulation. The disproportionate impact of a relatively small number of agents could only be inferred from analyzing the simulation results and drawing parallels to reality. To make the model more realistic, and in order to be able to potentially observe the long term influences of agents’ interactions, the possibility had to be created for agents to change their attitudes in response to social interactions.

In chapter 6 the model was expanded with a mechanism of attitude change regarding outgroups, based on the principle that attitudes change in a reciprocal fashion. It was assumed that if an agent interacted with someone from the outgroup who had a negative attitude towards the agent’s group, this resulted in the agent changing its attitude negatively towards the group the other person belonged to. When the other individual had a positive attitude, the agent’s attitude would be more positive after the interaction. Ingroup attitudes were left fixed. Because in reality negative events impact people more than positive ones (Baumeister, Bratslavsky, Finkenauer & Vohs, 2001; Ito, Larsen, Smith & Cacioppo, 1998; Rozin & Royzman, 2001; Taylor, 1991), the change in attitude after a negative interaction was ten times as strong as the change resulting from a positive interaction.

A final simulation study was conducted to investigate the consequences of this addition to the model. The simulated conditions were identical to the previous series of simulations:

the same conditions, including individual differences. In fact, the previous simulation were re-run in order to ensure the formation of social structure before the agents were made to change their attitudes in reaction to their social interactions.

The impact of this mechanism of attitude change on the results was profound. Unlike with the last simulation study, the extent of integration was no longer linearly related to the initial conditions of the simulations. Sometimes high levels of integration were observed under conditions that seemed initially unfavorable, as in the case with average mutual negative attitudes. By contrast, other seemingly more favorable conditions, like mutual tolerance, led to very low levels of integration. The explanations for these contradictory outcomes had to be sought in the micro level interactions between the agents.

As it turned out, the expectations regarding the potential disproportionate impact of small numbers of agents on the system at large was fully confirmed. In those simulations where initial mutual negativity eventually resulted in high levels of integration, the relatively few agents from both groups who harbored positive mutual attitudes proved to be the key to a positive attitude change dynamic that would come to entirely transform the social system in the long term. In the simulations where initial favorable conditions deteriorated and in the end led to high levels of segregation, marginalized minority agents turned out to be responsible.

At a more general level, surprisingly, *minority ingroup* attitudes turned out to be the strongest predictor of the simulation outcomes. The reason for this is twofold, and is related to the two previous scenarios. The reason that marginalized individuals from the minority had such a detrimental impact on social integration is that they negatively influenced all majority agents that interacted with them. They might have been influenced positively by individual interactions, but because of their negative attitude would quickly withdraw, ending this positive impact. Because marginalized agents also eschewed contact with ingroup members,

they ended up in places surrounded with many empty spaces, where the chances that they would be approached by majority members were relatively high. By comparison, agents who also had a negative outgroup attitude, but who had a positive ingroup attitude would become part of a minority cluster, surrounded by minority members only. As a result, unlike the marginalized agents, these agents would not interact with majority members and would not cause them to develop a negative attitude towards the minority. In this way, positive minority attitudes were instrumental in preventing the deterioration of intergroup relations.

In addition to preventing growing mutual negativity, positive minority ingroup attitudes also proved to be crucial in positive dynamics under unfavorable conditions, by ensuring the continued existence of a positive potential. In situations where the majority had a negative average outgroup attitude, minority members seeking contact with the majority often quickly became disappointed and developed increasingly negative attitudes towards them. This however did not happen so much to those with a positive ingroup attitude, because these agents, even though they might prefer some contact with the majority, were also quite content having contact with their ingroup only. Many of the agents with positive ingroup attitudes did not altogether develop a negative attitude towards the majority. This ensured that at a later time, when conditions would be more favorable, these agents were able to participate in interactions with the majority with mutually positive outcomes. Minority agents with a negative ingroup attitude did not join clusters of their own group and their attitude towards the majority usually continued to get worse as a result from additional encounters with majority members and as a result, these agents would often end up marginalized.

The conditions for positive dynamics between agents of both groups were often created by those who had positive attitudes to the ingroup and the outgroup. At points where segregated groups came close together in social space, unique opportunities arose for such agents to be in simultaneous contact with members from both groups. Because these spots

were localized at the fringes of the groups, and thus always surrounded by a number of vacant spaces, it was relatively easy for other willing agents to join. As a result, such a cluster could grow and develop a momentum of positive attitude change that could also transform negative agents to develop positive attitudes. The fact that these agents had positive ingroup attitudes was crucial for cluster forming, as agents with negative ingroup attitudes would have fled when other ingroup agents would start to arrive.

As can be seen from the description of these dynamical mechanisms, ingroup attitudes were crucially implied in many of the simulations' results. This relation is non-intuitive: understanding how individual agents behave would not easily lead to the inference that the minority ingroup variable would be so decisive overall. Also, the previous simulation studies had shown that this attitude was the weakest predictor of the three.

The reasons behind this peculiar outcome are related to the fact that the macro-level outcomes emerged from the local interactions of the micro-level agents. Because these interactions took place repeatedly over time, their cumulative effect was able to develop and unfold. Hence, the key to understanding such emergent properties is the analysis of the temporal evolution of the elements that make up the system. Because the temporal aspect is easily represented in a computer simulation, it could be shown how the formation and change of social structure was *caused* by the agents' behaviors. As a result, the gap between the macro- and micro-levels of analysis could be bridged, without having to reduce the former to the latter.

One striking difference between the results of this and the previous two simulation studies is that in this study positive minority ingroup attitudes were related to high levels of integration whereas the opposite appeared to be true in the others; positive ingroup attitudes were related to segregation. These outcomes appear incompatible even though the agents interacted on the basis of the same rules in all the simulations. The clue to this seeming

contradiction is that the processes responsible for these different outcomes take place simultaneously, but in different time frames. The simulations presented in chapter 5 showed that in the short term a positive ingroup attitude indeed makes minority agents cluster together. What was shown in chapter 6 however is that the same forces that drive clustering in the short term are important for ensuring integration on the long run.

These findings draw attention to the possibility that the choice of research method may severely limit or even determine the possible conclusions one is able to reach. Typical cross-sectional correlational research, for example, would probably lead to the conclusion that a wish for cultural maintenance leads to clustering/separation and that it is thus not conducive to multicultural integration. The opposite conclusion could only be reached using an approach that would afford insight into the causal mechanism of how minority clustering facilitates social integration on the long run. In this approach, the focus of attention would need to lie on the *processes* central to this mechanism, instead of on variables.

The simulation studies had the aim to understand multicultural integration at societal level on the basis of individual level characteristics. Verification of the outcomes of these studies would therefore ideally require large scale data including longitudinal measurements of peoples' social networks. Such datasets are unfortunately not readily available and costly to put together. However, large scale data that have been gathered in the context of other research are available. Though not ideal, these sources of information could help to tentatively compare simulation results with real observations. Such an analysis would also provide an opportunity to look at roles of additional variables, to provide a more realistic and complete picture of multicultural integration.

By combining information from three datasets an attempt was made in chapter 7 to compare simulation outcomes regarding minority clustering with real minority clustering in

the form of residential segregation. In addition, in order to help advance a more fine grained understanding of acculturation, measures of minority cultural beliefs were added in this analysis in addition to acculturation attitudes. Because this aggregate dataset combined information regarding typical psychological measures such as people's attitudes, and sociological variables relating to work, education, income and neighborhood characteristics, this analysis also provided an opportunity to see if such an integrative approach would yield a more precise understanding of multicultural integration than, for example, an exclusively sociological approach.

The simulation results were to some extent confirmed by the outcomes of the empirical analysis, as both indicated that minority clustering inhibits social integration over and above the effects of any other variables. In the empirical analysis this effect was found to be stronger however. The inclusion of the two measures of minorities' cultural beliefs substantially increased the explanatory value of the tested model, even after controlling for a host of background and socio-economic variables and acculturation attitudes. When the socio-economic variables were dropped from the model, the importance of these cultural beliefs increased, whereas minority acculturation attitudes remained fixed. Together, this was interpreted as an indication that cultural beliefs, and culture in general are, as suggested earlier (Triandis, 1997), important factors to consider in acculturation.

The analysis also showed that multicultural integration can to quite some extent be captured and understood by sociological variables, regarding socio-economic status and personal background information like sex and age, but that knowledge of psychological measures such as people's attitudes and beliefs substantially increases this understanding. As many of these variables are interrelated and causally linked, it seems that a full understanding of multicultural integration should be based on an integrative approach that combines the best of these different disciplines. Because the dynamical approach is particularly suited to

provide insight to how processes at different levels are related to each other, dynamical models such as the one presented in this work might provide a good platform for this.

Besides being a good vehicle to conceptually connect different kinds of theoretical approaches; dynamical models have some characteristics that can also help the development of theory. As was described and discussed during the stages of the development of the dynamical model of multicultural integration, existing theory had to be evaluated and sometimes reinterpreted and adapted. Dynamical models have to be formulated very precisely because they have to be translatable into algorithms or mathematical formulas. The need for this precision forces one to look at the definitions of variables in a different way, and to reevaluate how they are related to each other. In addition, as was shown in this work, computer simulations can help to analyze dynamical models and theories over their entire domain by systematically testing large numbers of conditions to which a model applies, and then to observe how variables relate to simulation outcomes. Comparable empirical testing would be, if possible in the first place, very costly and time consuming.

Pooling knowledge from different specializations and developing multidisciplinary dynamical models would certainly help in advancing our understanding of multicultural integration, but it seems that there is ample opportunity to further develop psychological theories of acculturation as well. Important questions were raised regarding minority, and especially majority acculturation attitudes, for example. In addition it would seem that the consideration of culture and cultural differences could potentially enrich our understanding of acculturation greatly. As these are rather central aspects of acculturation, the practical applicability of acculturation theory could potentially substantially increase with our advancing knowledge.

Looking at the prevalent social issues in many societies today, it seems that such knowledge would certainly be welcomed. Given the importance of multicultural integration,

some feeling of urgency might be in place, as there is no guarantee for it to happen naturally as a function of time. And even if, there is an abundance of evidence that points out that this process is very difficult. It is my hope that this work will contribute a little to help to resolve some of these issues.

References

- Ait Ouarasse, O., & van de Vijver, F. J. R. (2005). The role of demographic variables and acculturation attitudes in predicting sociocultural and psychological adaptation in Moroccans in the Netherlands. *International Journal of Intercultural Relations*, 29, 251-272.
- Ajzen, I. (2001). Nature and operation of attitudes. *Annual Review of Psychology*, 52, 27-58.
- Allport, G. W. (1954). *The nature of prejudice*. Cambridge: Addison-Wesley.
- Amir, Y. (1969). Contact hypothesis in ethnic relations. *Psychological Bulletin*, 71, 319-342.
- Anas, A. (1980). A model of residential change and neighborhood tipping. *Journal of Urban Economics*, 7, 358-370.
- Arends-Tóth, J., & van de Vijver, F. J. R. (2003). Multiculturalism and acculturation: Views of Dutch and Turkish-Dutch. *European Journal of Social Psychology*, 33, 249-266.
- Armes, K., & Ward, C. (1989). Cross-cultural transitions and sojourner adjustment in Singapore. *Journal of Social Psychology*, 129, 273-275.
- Axelrod, R. (1984). *The evolution of cooperation*. New York: Basic Books.
- Axelrod, R. (1997). *The Complexity of Cooperation: Agent-Based Models of Competition and Collaboration*. Princeton: Princeton University Press.
- Axelrod, R., & Hamilton, W. D. (1981). The evolution of cooperation. *Science*, 211, 1390-1396.
- Babiker, I. E., Cox, J. L., & Miller P. M. (1980). The measurement of cultural distance and its relationship to medical consultations, symptomatology, and examination performance of overseas students at Edinburgh University. *Social Psychiatry*, 15, 109-116.

- Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist*, 44, 1175-1184.
- Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science*, 1, 164-180.
- Bar-Yam, Y. (1997). *Dynamics of complex systems*. Cambridge, MA: Perseus.
- Barrette, G., Bourhis, R. Y., Personnaz, M., & Personnaz, B. (2004). Acculturation orientations of French and North African undergraduates in Paris. *International Journal of Intercultural Relations*, 28, 415–438.
- Bartoli, A., Bui-Wrzosinska, L., & Nowak, A. (2010). Peace is in movement: A dynamical systems perspective on the emergence of peace in Mozambique. *Peace and Conflict*, 16, 211-230.
- Barton, S. (1994). Chaos, self-organization, and psychology. *American Psychologist*, 49, 5–14.
- Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of General Psychology*, 5, 323–370.
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117, 497-529.
- Benartzi, S., & Thaler, R. H. (1995). Myopic loss aversion and the equity premium puzzle. *The Quarterly Journal of Economics*, 110, 73-92.
- Berry, J. W. (1970). Marginality, stress and ethnic identification in an acculturated Aboriginal community. *Journal of cross cultural psychology*, 1, 17-22.
- Berry, J. W. (1974). Psychological aspects of cultural pluralism: Unity and identity reconsidered. *Topics in Cultural Learning*, 2, 17-22.

Berry, J. W. (1980). Acculturation as varieties of adaptation. In Padilla, A. M. (Ed.), *Acculturation: theory, models and some new findings* (pp. 9-25). Boulder: Westview Press.

Berry, J. W. (1984). Multicultural policy in Canada: A social psychological analysis. *Canadian Journal of Behavioural Science*, 16, 353-370.

Berry, J. W. (1990). Psychology of acculturation. In J. Berman (Ed.), *Cross-cultural perspectives: Nebraska Symposium on Motivation* (pp. 201-234). Lincoln: University of Nebraska Press.

Berry, J. W. (1997). Immigration, acculturation and adaptation. *Applied Psychology: an International Review*, 46, 5-68.

Berry, J.W. (2003). Conceptual approaches to acculturation. In K. Chun, P. Balls-Organista, & G. Marin (Eds.), *Acculturation: Advances in theory, measurement and applied research* (pp. 17–37). Washington, DC: APA Press.

Berry, J. W. (2006). Acculturative stress. In P. Wong & L. Wong (Eds.), *Handbook of multicultural perspectives on stress and coping* (pp. 283–294). New York: Springer.

Berry, J. W. (2009). A critique of critical acculturation. *International Journal of Intercultural Relations*, 33, 361-371.

Berry, J. W., & Annis, R. C. (1974). Acculturative stress: The role of ecology, culture and differentiation. *Journal of Cross-Cultural Psychology*, 5, 382-406.

Berry, J. W., & Kim, U. (1988). Acculturation and mental health. In P. R. Dasen, J. W. Berry, & N. Sartorius (Eds.), *Health and cross-cultural psychology: Towards applications* (pp. 207-238). Newbury Park: Sage.

Berry, J. W., Kim, U., Minde, T., & Mok, D. (1987). Comparative studies of acculturative stress. *International Migration Review*, 21, 491-511.

Berry, J. W., Phinney, J. S., Sam, D. L., & Vedder, P. (2006). Immigrant youth: Acculturation, identity, and adaptation. *Applied Psychology: An International Review*, 55, 303–332.

Berry, J. W., Poortinga, Y. H., Segall, M. H. & Dasen, P. R. (2002). *Cross-cultural psychology: Research and applications*. Cambridge: Cambridge University Press.

Berry, J. W., & Sabatier, C. (2010). Acculturation, discrimination, and adaptation among second generation immigrant youth in Montreal and Paris, *International Journal of Intercultural Relations*, 34, 191-207.

Berry, J. W., & Sam, D. (1996). Acculturation and adaptation. In J. W. Berry, M. H. Segall, & C. Kagitcibasi (Eds.), *Handbook of Cross-Cultural Psychology, Vol 3, Social Behaviour and Applications*. Boston: Allyn and Bacon.

Berry, J. W., van de Koppel, J. M. H., Sénéchal, C., Annis, R. C., Bahuchet, S., Cavalli-Sforza, L. L., & Witkin, H. A. (1986). *On the edge of the forest: Cultural adaptation and cognitive development in Central Africa*. Lisse: Swets and Zeitlinger.

Binder, J., Zagefka, H., Brown, R., Funke, F., Kessler, T., Mummendey, A., et al. (2009). Does contact reduce prejudice or does prejudice reduce contact? A longitudinal test of the contact hypothesis among majority and minority groups in three European countries. *Journal of Personality and Social Psychology*, 96, 843-856.

Birman, D., Trickett, E. J., & Vinokurov, A. (2002). Acculturation and adaptation of Soviet Jewish refugees: Predictors of adjustment across life domains. *American Journal of Community Psychology*, 30, 585-607.

Blanchard, F. A., Weigel, R. H., & Cook, S. W. (1975). The effects of relative competence of group members upon interpersonal attraction in cooperating interracial groups. *Journal of Personality and Social Psychology*, 32, 519–530.

- Blau, P. M. (1956). Social mobility and interpersonal relations. *American Sociological Review*, 21, 290-295.
- Bobo, L., & Zubrinsky, C. L. (1996). Attitudes toward residential integration: Perceived status differences, mere in-group preference, or racial prejudice? *Social Forces*, 74, 883-909.
- Bolt, G., Hooimeijer, P., & van Kempen, R. (2002). Ethnic segregation in the Netherlands: New patterns, new policies? *Tijdschrift voor Economische en Social Geografie*, 93, 214-220.
- Bolt, G., Özüekren, A. S., & Philips, D. (2010). Linking integration and residential segregation. *Journal of Ethnic and Migration Studies*, 36, 169-186.
- Bourhis, R. Y., Barrette, G., El-Geledi, S., & Schmidt, R. S. (2009). Acculturation orientations and social relations between immigrant and host community members in California. *Journal of Cross-Cultural Psychology*, 40, 443-466.
- Bourhis, R. Y., Moise, L. C., Perreault, S., & Senécal, S. (1997). Towards an interactive acculturation model: A social psychological approach. *International Journal of Psychology*, 32, 369-386.
- Breugelmans, S. M., & van de Vijver, F. J. R. (2004). Antecedents and components of majority attitudes toward multiculturalism in the Netherlands. *Applied Psychology: An International Review*, 53, 400-422.
- Brewer, M. B. (1979). In-group bias in the minimal intergroup situation: A cognitive-motivational analysis. *Psychological Bulletin*, 86, 307-324.
- Brewer, M. B. (1999). The psychology of prejudice: Ingroup love or outgroup hate? *Journal of Social Issues*, 55, 429-444.
- Brewer, M. B., & Kramer, R. M. (1985). The psychology of intergroup attitudes and behavior. *Annual Review of Psychology*, 36, 219-243.

Brown, R., Eller, A., Leeds, S., & Stace, K. (2007). Intergroup contact and intergroup attitudes: A longitudinal study. *European Journal of Social Psychology*, 37, 692–703.

Brown, R., & Hewstone, M. (2005). An integrative theory of intergroup contact. *Advances in Experimental Social Psychology*, 37, 255-343.

Brown, R., Maras, P., Masser, B., Vivian, J., & Hewstone, M. (2001). Life on the ocean wave: Testing some intergroup hypotheses in a naturalistic setting. *Group Processes and Intergroup Relations*, 4, 81-97.

Brown, R. J., Vivian, J., & Hewstone, M. (1999). Changing attitudes through intergroup contact: The effects of group membership salience. *European Journal of Social Psychology*, 29, 741–764.

Byrne, D. (1961). Interpersonal attraction and attitude similarity. *Journal of Abnormal and Social Psychology*, 62, 713–715.

Byrne, D., Gouaux, C., Griffitt, W., Lamberth, J., Murakawa, N., Prasad, M., Prasad, A., & Ramirez, M. (1971). The ubiquitous relationship: Attitude similarity and attraction: A cross cultural study. *Human Relations*, 24, 201–207

Caetano, G., & Maheshri, V. (2011). *School segregation and the identification of tipping points*. Retrieved September 11, 2011, from Texas A&M University, Department of Economics website: http://econweb.tamu.edu/puller/Stata_TEM_papers/Maheshri.pdf

Card, D., Mas, D., & Rothstein, J. (2008). Tipping and the dynamics of segregation. *The Quarterly Journal of Economics*, 123, 177–218.

Castles, S., & Miller, M. (2009). *The age of migration: International population movements in the modern world*, 4th edition. Hampshire: Palgrave Macmillan.

Charles, C. Z. (2003). The dynamics of racial residential segregation. *Annual Review of Sociology*, 29, 167–207.

Church, A. T. (1982). Sojourner adjustment. *Psychological Bulletin*, 91, 540-572.

Clark, W.A.V. (1991). Residential preferences and neighborhood racial segregation: A Test of the Schelling segregation model. *Demography*, 28, 1-19.

Clotfelter, C. T. (1976). School desegregation, "tipping", and private school enrollment. *Journal of Human Resources*, 11, 29-50.

Cohen, M.D., March, J.G., & Olsen, J.P. (1972). The garbage can model of organizational choice. *Administrative Science Quarterly*, 17, 1-25.

Cohon, J. D. (1981). Psychological adaptation and dysfunction among refugees. *International Migration Review*, 15, 255-275.

Cole, D. (1999). *No equal justice: Race and class in the American criminal justice system*. New York: New Press.

Colletta, N. J., & Cullen, M. L. (2000). *Violent conflict and the transformation of social capital*. Washington, D.C.: The World Bank.

Condon, J. W., & Crano, W. D. (1988). Inferred evaluation and the relation between attitude similarity and interpersonal attraction. *Journal of Personality and Social Psychology*, 54, 789–797.

Crone, M., & Harrow, M. (2011). Homegrown terrorism in the West. *Terrorism and Political Violence*, 23, 521-536.

Cuddy, A., Fiske, S., & Glick, P. (2008). Warmth and competence as universal dimensions of social perception: The stereotype content model and the BIAS Map. *Advances in Experimental Social Psychology*, 40, 61–149.

Darby, J. (1986). *Intimidation and the control of conflict in Northern Ireland*. Syracuse: Syracuse University Press.

Dawson, B. A. (2009). Discrimination, stress, and acculturation among Dominican immigrant women. *Hispanic Journal of Behavioral Sciences*, 31, 96-111.

de Raad, W.E. (2013). A dynamic approach to multicultural integration. In A. Nowak, K. Nowak-Winkowska & D. Bree (Eds.). *Complex Human Dynamics: From mind to societies*. New York: Springer.

de Raad, W.E., Nowak, A., & Borkowski, W. (2013). Modeling dynamics of multicultural integration and conflict. In K. Sycara, M. Gelfand and A. Abbe (Eds.), *Models for intercultural collaboration and negotiation*. New York: Springer.

Denton, N. A., & Massey, D. S. (1991). Patterns of neighbourhood transition in a multiethnic world: U.S. metropolitan areas, 1970-1980. *Demography*, 28, 41-63.

Deutsch, M. (1973). *The resolution of conflict; Constructive and destructive processes*. New Haven: Yale University Press.

Devine, P. G. (1989). Stereotypes and Prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology*, 56, 5-18.

Dijker, A. J. M. (1987). Emotional reactions to ethnic minorities. *European Journal of Social Psychology*, 17, 305-325.

Dinh, K. T., & Bond, M. A. (2008). The other side of acculturation: Changes among host individuals and communities in their adaptation to immigration populations. *American Journal of Community Psychology*, 42, 283-285.

Donà, G., & Berry, J. W. (1994). Acculturation attitudes and acculturative stress of central american refugees. *International Journal of Psychology*, 29, 57-70.

Dovidio, J., Gaertner, S., & Kawakami, K. (2003). Intergroup contact: The past, present and the future. *Group Processes and Intergroup Relations*, 6, 5-20.

Dovidio, J., Kawakami, K., Johnson, C., Johnson, B., & Howard, A. (1997). The nature of prejudice: Automatic and controlled processes. *Journal of Experimental Social Psychology*, 33, 510-540.

Dovidio, J., Kawakami, K., & Gaertner, S. L. (2002). Implicit and explicit prejudice and interracial interaction. *Journal of Personality and Social Psychology*, 82, 62-68.

Duckitt, J. (2001). A dual process cognitive-motivational theory of ideology and prejudice. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 33, pp. 41–113). San Diego: Academic Press.

Dunbar, R. I. M. (1993). Co-evolution of neocortical size, group size and language in humans. *Behavioral and Brain Sciences*, 16, 681-735.

Dunn, K.M. (1998). Rethinking ethnic concentration The case of Cabramatta, Sydney. *Urban Studies*, 35, 503-527.

Edwards, W. (1954). The theory of decision making. *Psychological Bulletin*, 51, 380-417.

Eller, A., & Abrams, D. (2003). “Gringos” in Mexico: Cross-sectional and longitudinal effects of language school-promoted contact on intergroup bias. *Group Processes and Intergroup Relations*, 6, 55–75.

Eller, A., & Abrams, D. (2004). Come together: Longitudinal comparisons of Pettigrew’s reformulated intergroup contact model and the common ingroup identity model in Anglo-French and Mexican-American contexts. *European Journal of Social Psychology*, 34, 229–256.

Emler, N., & Reicher, S. (2005). Delinquency: Cause or consequence of social exclusion? In D. Abrams, J. Marqués and M. Hogg (eds.), *The social psychology of inclusion and exclusion*, (pp. 211-241). Philadelphia: Psychology Press.

Epstein, J., & Axtell, R. (1996). *Growing Artificial Societies: Social Science from the Bottom Up*. Cambridge: MIT Press.

Feagin, J.R. (1991). The continuing significance of race: Antiblack discrimination in public places. *American Sociological Review*, 56, 11-116.

- Feldman, A. S., & Tilly, C. (1960). The interaction of social and physical space. *American Sociological Review*, 25, 877-884.
- Fiske, S. T., Cuddy, A., & Glick, P. (2006). Universal dimensions of social cognition: Warmth and competence. *Trends in Cognitive Sciences*, 11, 77– 83.
- Fiske, S. T., Cuddy, A. J., Glick, P., & Xu, J. (2002). A model of (often mixed) stereotype content: Competence and warmth respectively follow from the perceived status and competition. *Journal of Personality and Social Psychology*, 82, 878 –902.
- Florack, A., Piontkowski, U., Rohmann, A., Balzer, T., & Perzig, S. (2003). Perceived intergroup threat and attitudes of host community members toward immigrant acculturation. *The Journal of Social Psychology*, 143, 633-648.
- Furnham, A., & Bochner, S. (1982). Social difficulty in a foreign culture: An empirical analysis of culture shock. In S. Bochner (Ed.), *Cultures in contact: Studies in cross-cultural interactions* (pp. 161-198). Elmsford: Pergamon.
- Furnham, A., & Bochner, S. (1986). *Culture shock: Psychological reactions to unfamiliar environments*. London: Methuen.
- Gallagher, A. M. (1995). The approach of government: Community relations and equity. In S. Dunn (Ed.), *Facets of the conflict in Northern Ireland* (pp. 27–43). New York: St. Martin's Press.
- Gans, H. (1992). Acculturation, assimilation and mobility. *Ethnic and Racial Studies*, 30, 152–164.
- Geschke, D., Mummendey, A., Kessler, T., & Funke, F. (2010). Majority members' acculturation goals as predictors and effects of attitudes and behaviours towards immigrants. *British Journal of Social Psychology*, 49, 489-506.

Gijsberts, M., & Dagevos, J. (2007). The socio-cultural integration of ethnic minorities in the Netherlands: Identifying neighbourhood effects on multiple integration outcomes. *Housing Studies*, 22, 805-831.

Gilbert, N., & Troitzsch, K. G. (2005). *Simulation for the social scientist*, 2nd edition. Maidenhead: Open University Press.

Gonzalez, R., & Brown, R. (2003). Generalization of positive attitude as a function of subgroup and superordinate group identifications in intergroup contact. *European Journal of Social Psychology*, 33, 195-214.

Greenland, K., & Brown, R. (1999). Categorization and intergroup anxiety in contact between British and Japanese nationals. *European Journal of Social Psychology*, 29, 503–522.

Haddad, Y. Y., & Balz, M. J. (2006). The October riots in France: A failed immigration policy or the empire strikes back? *International Migration*, 44, 24-32.

Hagendoorn, L. (1993). Ethnic categorization and outgroup exclusion: The role of cultural values and social stereotypes in the construction of ethnic hierarchies. *Ethnic and Racial Studies*, 16, 26-51.

Hegselmann, R. (1998). Modeling social dynamics by cellular automata. In W.G. Liebrand, A. Nowak & R. Hegselmann (Eds), *Computer modeling of social processes*, pp. 37-64. London: Sage publications ltd.

Healy, J. (2006). Locality matters: Ethnic segregation and community conflict-the experience of protestant girls in Belfast. *Children and Society*, 20, 105-115.

Hill, R. A., & Dunbar, R. I. M. (2003). Social network size in humans. *Human Nature*, 14, 53-72.

Hofstede, G. (1980). *Culture's consequences*. Beverly Hills: Sage.

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations* (2nd ed.). Thousand Oaks, CA: Sage.

Hofstede, G., & McCrae, R. R. (2004). Personality and culture revisited: Linking traits and dimensions of culture. *Cross-Cultural Research*, 38, 52-88.

Horenczyk, G. (1997). Immigrants' perception of host attitudes and their reconstruction of cultural groups. *Applied Psychology: an International Review*, 46, 34-38.

Hovey, J. D., & King, C. A. (1996). Acculturative stress, depression, and suicidal ideation among immigrant and second-generation Latino adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry*, 35, 1183-1192.

Howell, D. C. (2002). *Statistical methods for psychology* (5th ed.). Pacific Grove: Duxbury.

Hurh, W. M., & Kim, K. C. (1984). Adhesive sociocultural adaptation of Korean immigrants in the U.S.: An alternative strategy of minority adaptation. *International Migration Review*, 18, 188-216.

Hurtado, S. (1994). The institutional climate for talented Latino students. *Research in Higher Education*, 35, 21-41.

Hurtado, S., & Carter, D.F. (1997). Effects of college transition and perceptions of the campus racial climate on Latino college students' sense of belonging. *Sociology of Education*, 70, 135-157.

Inglehart, R., & Norris, P. (2003). *Rising tide: Gender equality and cultural change around the world*. New York: Cambridge University Press.

Inglehart, R., & Welzel, C. (2005). *Modernization, cultural change and democracy: The human development sequence*. New York: Cambridge University Press.

Islam, M. R., & Hewstone, M. (1993). Dimensions of contact as predictors of intergroup anxiety, perceived out-group variability, and out-group attitude: An integrative model. *Personality and Social Psychology Bulletin*, 19, 700-710.

Ito, T.A., Larsen, J.T., Smith, N.K., & Cacioppo, J.T. (1998). Negative information weighs more heavily on the brain: The negativity bias in evaluative categorizations. *Journal of Personal and Social Psychology*, 75, 887-900.

Jasinskaja-Lahti, I., Liebkind, K., Horenczyk, G., & Schmitz, P. (2003). The interactive nature of acculturation: Perceived discrimination, acculturation attitudes and stress among young ethnic repatriates in Finland, Israel and Germany. *International journal of intercultural relations*, 27, 79-97.

Juang, L. P., & Cookston, J. T. (2009). Acculturation, discrimination, and depressive symptoms among Chinese American adolescents: A longitudinal study. *Journal of Primary Prevention*, 30, 475-496.

Kagitcibasi, C. (1997). Whither multiculturalism? *Applied Psychology: an International Review*, 46, 44-49.

Kao, G., & Thompson, J.S. (2003). Racial and ethnic stratification in educational achievement and attainment. *Annual Review of Sociology*, 29, 417-442.

Kelso, J. A. S. (1995). *Dynamic Patterns: The Self-organization of Brain and Behavior*. Cambridge, MA: MIT Press.

King, G., & Langche, Z. (2001). Explaining rare events in international relations. *International Organization*, 55, 693–715.

Knight, G. P., & Kagan, S. (1977). Acculturation of prosocial and competitive behaviors among second- and third-generation Mexican-American children. *Journal of Cross-Cultural Psychology*, 8, 273-284.

Koff, H., & Duprez, D. (2009). The 2005 riots in France: The international impact of domestic violence. *Journal of Ethnic and Migration Studies*, 35, 713-730.

Komisarof, A. (2009). Testing a modified Interactive Acculturation Model in Japan: American–Japanese coworker relations. *International Journal of Intercultural Relations*, 33, 399-418.

Kosic, A. (2002). Acculturation Attitudes, Need for Cognitive Closure, and Adaptation of Immigrants. *Journal of Social Psychology*, 142, 179-201.

Kosic, A., Mannetti, L., & Sam, D. L. (2005). The role of majority attitudes towards out-group in the perception of the acculturation strategies of immigrants. *International Journal of Intercultural Relations*, 29, 273-288.

Krishnan, A. & Berry, J. W. (1992). Acculturative stress and acculturation attitudes among Indian immigrants to the United States. *Psychology and Developing Societies*, 4, 187–212.

Kvernmo, S., & Heyerdahl, S. (2003). Acculturation strategies and ethnic identity as predictors of behaviour problems in arctic minority adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*, 42, 57–65.

Kwak, K. (2003). Adolescents and their parents: A review of intergenerational family relations for immigrant and non-immigrant families. *Human Development*, 46, 115-136.

Kymlicka, W. (2003). Immigration, citizenship, multiculturalism: Exploring the links. In S. Spencer (Ed.), *The politics of migration: Managing opportunity, conflict and change* (pp. 195-208). Oxford: Blackwell.

Laachir, K. (2007). France’s ‘ethnic’ minorities and the question of exclusion. *Mediterranean Politics*, 12, 99-105.

Latané, B. (1981). The psychology of social impact. *American Psychologist*, 36, 343-356.

Latané, B., & Liu, J. H. (1996). The intersubjective geometry of social space. *Journal of Communication*, 46, 26-34.

Latané, B., Liu, J. H., Nowak, A., Bonevento, M., & Zheng, L. (1995). Distance matters: Physical space and social impact. *Personality and Social Psychology Bulletin*, 21, 795-805.

Lazarus, R. S. (1997). Acculturation isn't everything. *Applied Psychology: an International Review*, 46, 39-43.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal and coping*. New York: Springer.

Lewenstein, M., Nowak, A., & Latane, B. (1993). Statistical mechanics of social impact. *Physical Review A*, 45, 763-776.

Liebkind, K., & Jasinskaja-Lahti, I. (2000). The influence of experiences of discrimination on psychological stress: A comparison of seven immigrant groups. *Journal of Community & Applied Social Psychology*, 10, 1-16.

Liebkind, K., & McAlister, A. L. (1999). Extended contact through peer modeling to promote tolerance in Finland. *European Journal of Social Psychology*, 29, 765–780.

Lorentz, E. (1963). Deterministic nonperiodic flow. *Journal of Atmospheric Science*, 20, 282- 293.

Lubbers, M., Gijsberts, M., & Scheepers, P. (2002). Extreme right-wing voting in Western Europe. *European Journal of Political Research*, 41, 345-378.

Maslow, A. H. (1954). *Motivation and personality*. New York: Harper.

McAdams, R.H. (1995). Cooperation and conflict: The economics of group status production and race discrimination. *Harvard Law Review*, 108, 1003-1084.

- McCarty, C., Killworth, P. D., Bernard, H. R., Johnsen, E. C., & Shelley, G. A. (2001). Comparing two methods for estimating network size. *Human Organization*, 60, 28-39.
- McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, 27, 415– 444.
- Mimkes, J. (1995). Binary alloys as a model for the multicultural society. *Journal of Thermal Analysis*, 43, 524-537.
- Mimkes, J. (2000). Society as a many particle system. *Journal of Thermal Analysis and Calorimetry*, 60, 1055-1069.
- Montreuil, A., & Bourhis, R. Y. (2001). Majority acculturation orientations toward "valued" and "devalued" immigrants. *Journal of Cross-Cultural Psychology*, 32, 698-719.
- Moody, J. (2001). Race, school integration, and friendship segregation in America. *American Journal of Sociology*, 107, 679–716.
- Musterd, S. (2005). Social and Ethnic Segregation in Europe: Levels, Causes, and Effects. *Journal of Urban Affairs*, 27, 331-348.
- Nakagaki, T., Kobayashi, R., Nishiura, Y., & Ueda, T. (2004). Obtaining multiple separate food sources: Behavioural intelligence in the physarum plasmodium. *Proceedings of the Royal Society of London Series, B-Biological Science*, 271, 2305–2310.
- Nakagaki, T., Yamada, H., & Toth, A. (2000) Maze-solving by an amoeboid organism. *Nature*, 407, 470–470.
- Nesdale, D. (2002) Acculturation attitudes and the ethnic and host-country identification of immigrants. *Journal of Applied Social Psychology*, 32, 1488–1507.
- Nguyen, H. H., & von Eye, A. (2002). The Acculturation Scale for Vietnamese Adolescents (ASVA): A bidimensional perspective. *International Journal of Behavioral Development*, 26, 202-213.

Noh, S., & Kaspar, V. (2003). Perceived discrimination and depression: Moderating effects of coping, acculturation, and ethnic support. *American Journal of Public Health, 93*, 232–238.

Norris, P., & Inglehart, R. (2004). *Sacred and secular: Religion and politics worldwide*. New York: Cambridge University Press.

Nowak, A. (2004). Dynamical minimalism: Why less is more in psychology. *Personality and Social Psychology Review, 8*, 183-192.

Nowak, A., Szamrej, J., & Latané, B. (1990). From private attitude to public opinion: a dynamical theory of social impact. *Psychological Review, 97*, 362-376.

Nowak, A., & Vallacher, R. R. (2002). Computational models of social processes. In L. Nadel (Ed.), *Encyclopedia of cognitive science* (vol. 4, pp. 81-84). London: Nature Publishing Group.

Oberg, K. (1960). Culture shock: Adjustment to new cultural environments. *Practical Anthropology, 7*, 177-182.

Ogbu, J.U. (1978). *Minority Education and Caste: The American System in Cross-Cultural Perspective*. New York: Academic Press.

Ogbu, J.U. (1990). Minority education in comparative perspective. *Journal of Negro Education, 59*, 45-57.

Orfied, G., & Lee, C. (2005). *Why segregation matters: Poverty and educational inequality*. Cambridge: The Civil Rights Project, Harvard University.

Pager, D., & Shepherd, H. (2008). The sociology of discrimination: Racial discrimination in employment, housing, credit, and consumer markets. *Annual Review of Sociology, 34*, 181–209.

Parekh, B. (2000). *Rethinking multiculturalism: Cultural diversity and political theory*. London: MacMillan.

- Pauly, R. (2004). *Islam in Europe: Integration or Marginalization*. Aldershot: Ashgate Publishing.
- Peleman, K. (2002). The impact of residential segregation on participation in associations: The case of Moroccan women in Belgium. *Urban Studies*, 39, 727-747.
- Pettigrew, T. F. (1997). Generalized intergroup contact effects on prejudice. *Personality and Social Psychology Bulletin*, 23, 173–185.
- Pettigrew, T. F. (1998a). Intergroup contact theory. *Annual Review of Psychology*, 49, 65–85.
- Pettigrew, T. F. (1998b). Reactions toward the new minorities of Western Europe. *Annual Review of Sociology*, 24, 77–103
- Pettigrew, T. F., & Tropp, L. R. (2006). A meta-analytic test of intergroup contact theory. *Journal of Personality and Social Psychology*, 90, 751-783.
- Phalet, K., & Schonpflug, U. (2001). Intergenerational transmission of collectivism and achievement values in two acculturation contexts: The case of Turkish families in Germany and Turkish and Moroccan families in the Netherlands. *Journal of Cross-Cultural Psychology*, 32, 186-201.
- Phinney, J. S. (1990). Ethnic identity in adolescents and adults: Review of research. *Psychological Bulletin*, 108, 499-514.
- Phinney, J. S., Berry, J. W., Vedder, P., & Liebkind, K. (2006). The acculturation experience: Attitudes, identities and behaviors of immigrant youth. In J. W. Berry, J. S. Phinney, D. L. Sam, & P. Vedder. (Eds.), *Immigrant youth in cultural transition: Acculturation, identity and adaptation across national contexts* (pp. 71-116). Mahwah: Lawrence Erlbaum Associates.
- Phinney, J. S., Chavira, V., & Williamson, Lisa. (1992). Acculturation attitudes and self-esteem among high school and college students. *Youth & Society*, 23, 299-312.

Phinney, J., & Vedder, P. (2006). Family relationship values of adolescents and parents: Intergenerational discrepancies and adaptation. In J. Berry, J. Phinney, D. Sam & P. Vedder (Eds.), *Immigrant youth in cultural transition acculturation, identity and adaptation across national contexts* (pp. 167- 184). Mahwah: Lawrence Erlbaum Associates.

Piontkowski, U., Florack, A., Hoelker, P., & Obdržálek, P. (2000) Predicting acculturation attitudes of dominant and non-dominant groups. *International Journal of Intercultural Relations*, 24, 1-26.

Piontkowski, U., Rohmann, A., & Florack, A. (2002). Concordance of acculturation attitudes and perceived threat. *Group Processes and Intergroup Relations*, 5, 221-232.

Portes, A., & Zhou, M. (1993). The new second generation: Segmented assimilation and its variants. *Annals of the American Academy of Political and Social Sciences*, 530, 74-96.

Post, J.M. (2005). When hatred is bred in the bone: Psycho-cultural foundations of contemporary terrorism. *Political Psychology*, 26, 615–636.

Precht, T. (2007). *Home grown terrorism and Islamist radicalisation in Europe – from conversion to terrorism*. Danish Ministry of Justice, Copenhagen.

Putnam, R. D. (1993). The prosperous community: Social capital and social life. *American Prospect*, 13, 35-42.

Quillian, L. (1995). Prejudice as a response to perceived group threat: Population composition and anti-immigrant and racial prejudice in Europe. *American Sociological Review*, 60, 586-611.

Redfield, R., Linton, R. & Herskovits, M.J. (1936). Memorandum for the study of acculturation. *American anthropologist*, 38, 149-152.

Richmond, A. (1993). Reactive migration: Sociological perspectives on refugee movements. *Journal of Refugee Studies*, 6, 7-24.

- Rogler, L. H. (1994). International migrations: a framework for directing research. *American Psychologist*, 49, 701-708.
- Rogler, L. H., Cortes, D. E., & Malgady, R. G. (1991). Acculturation and mental health status among Hispanics: convergence and new directions for research. *American Psychologist*, 46, 585-597.
- Rohmann, A., Florack, A., & Piontkowski, U. (2006). The role of discordant acculturation attitudes in perceived threat: An analysis of host and immigrant attitudes in Germany. *International Journal of Intercultural Relations*, 30, 683-702.
- Rothbart, M., Fulero, S., Jensen, C., Howard, J., & Birrell, P. (1978). From individual to group impressions: Availability heuristics in stereotype formation. *Journal of Experimental Social Psychology*, 14, 237-255.
- Rozin, P., & Royzman, E. B. (2001). Negativity bias, negativity dominance, and contagion. *Personality and Social Psychology Review*, 5, 296 –320.
- Rudmin, F. W. (2003). Critical history of the acculturation psychology of assimilation, separation, integration, and marginalization. *Review of General Psychology*, 7, 3-37.
- Rudmin, F. W. (2009). Constructs, measurements and models of acculturation and acculturative stress. *International Journal of Intercultural Relations*, 33, 106-123.
- Rudmin, F. W., & Ahmadzadeh, V. (2001). Psychometric critique of acculturation psychology: The case of Iranian migrants in Norway. *Scandinavian Journal of Psychology*, 42, 41-56.
- Ruggiero, K. M., Taylor, D. M., & Lambert, W. E. (1996). A model of heritage culture maintenance: The role of discrimination. *International Journal of Intercultural Relations*, 20, 47-67.

Rumberger, R.W., & Palardy, G.J. (2005). Does segregation still matter? The impact of student composition on academic achievement in high school. *Teachers College Record*, 107, 1999-2045.

Ryder, A. G., Alden, L. E., & Paulhus, D. L. (2000). Is acculturation unidimensional or bidimensional? A head to head comparison in the prediction of personality, self-identity and adjustment. *Journal of Personality and Social Psychology*, 79, 49-65.

Rydgren, J. (2007). The sociology of the radical right. *Annual Review of Sociology*, 33, 241-262.

Sabatier, C., & Berry, J. (2008). The role of family acculturation, parental style, and perceived discrimination in the adaptation of second-generation immigrant youth in France and Canada. *European Journal of Developmental Psychology*, 5, 159-185.

Sageman, M. (2004). *Understanding terror networks*. Philadelphia: University of Pennsylvania Press.

Samuelson, P. A., & Nordhaus, W. D. (2005). *Economics*, 18th edition. Boston: McGraw Hill.

Sayegh, L., & Lasry, J-C. (1993) Immigrants' adaptation in Canada: Assimilation, acculturation and orthogonal cultural identification. *Canadian Psychology*, 34, 98-109.

Scheepers, P., Te Grotenhuis, M., & van der Slik, F. (2002). Education, religiosity and moral attitudes: explaining cross-national effect differences. *Sociology of Religion*, 63, 157–176.

Schelling, T. C. (1971). Dynamic models of segregation. *Journal of Mathematical Sociology*, 1, 143-186.

Schelling, T.C. (1972). A Process of Residential Segregation: Neighborhood Tipping. in Pascal, A. (ed.), *Racial Discrimination in Economic Life*. Lexington, MA: D. C. Heath.

Scherpenzeel, A.C., & Das, M. (2010). "True" longitudinal and probability-based internet panels: Evidence from the Netherlands. In Das, M., P. Ester, and L. Kaczmirek (Eds.), *Social and behavioral research and the internet: Advances in applied methods and research strategies*. (pp. 77-104). Boca Raton: Taylor & Francis.

Schönpflug, U. (1997). Acculturation: Adaptation or development? *Applied Psychology: an International Review*, 46, 52-55.

Schmitz, P. (1992). Acculturation styles and health. In S. Iwawaki, Y. Kashima, & K. Leung (Eds.), *Innovations in cross-cultural psychology* (pp. 360-370). Amsterdam: Swets & Zeitlinger.

Schmitz, P. (1994). Acculturation and adaptation process among immigrants in Germany. In A.-M. Bouvy, F. J. R. van de Vijver, & P. Schmitz (Eds.), *Journeys into cross-cultural psychology* (pp.142-157). Amsterdam: Swets & Zeitlinger.

Schuster, H. G., & Just, W. (2005). *Deterministic Chaos* (4th ed.). Weinheim: Wiley-VCH Verlag GmbH & Co. KGaA.

Schwartz, S.H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. *Advances in Experimental Social Psychology*, 25, 1-65.

Searle, W., & Ward, C. (1990). The prediction of psychological and sociocultural adjustment during cross-cultural transitions. *International Journal of Intercultural Relations*, 14, 449-464.

Semyonov, M., & Glikman, A. (2009). Ethnic residential segregation, social contacts, and anti-minority attitudes in European societies. *European Sociological Review*, 25, 693-708.

Sherif, M. (1966). *In Common Predicament: Social Psychology of Intergroup Conflict and Cooperation*. Boston: Houghton Mifflin.

- Sidanius, J., & Pratto, F. (1999). *Social dominance: An intergroup theory of social hierarchy and oppression*. New York: Cambridge University Press.
- Silber, M.D., & Bhatt, A. (2007). *Radicalization in the West: The Homegrown Threat*. New York: New York City Police Department.
- Simpson, L., & Finney, N. (2009). Spatial patterns of internal migration: Evidence for ethnic groups in Britain. *Population, Space and Place*, 15, 37-56.
- Smelser, N. J. (2007). *The faces of terrorism: Social and psychological dimensions*. Princeton: Princeton University Press.
- Stephan, W. G., Diaz-Loving, R., & Duran, A. (2000). Integrated threat theory and intercultural attitudes: Mexico and the United States. *Journal of Cross-Cultural Psychology*, 31, 240–249.
- Stephan, W. G., & Stephan, C. W. (1985). Intergroup anxiety. *Journal of Social Issues*, 41, 157–175.
- Stephan, W. G., & Stephan, C. W. (2000). An integrated threat theory of prejudice. In S. Oskamp (Ed.), *Reducing prejudice and discrimination* (pp. 23– 45). Mahwah: Erlbaum.
- Stephan, W. G., Stephan, C. W., & Gudykunst, W. B. (1999). Anxiety in intercultural relations: A comparison of anxiety/uncertainty management theory and integrated threat theory. *International Journal of Intercultural Relations*, 23, 613–628.
- Steffensmeier, D. & Demuth, S. (2000). Ethnicity and sentencing outcomes in U.S. federal courts: Who is punished more harshly? *American Sociological Review*, 65, 705-729.
- Tajfel, H. (1981). *Human groups and social categories: Studies in social psychology*. Cambridge: Cambridge University Press.
- Tajfel, H. (1982). Social psychology of intergroup relations. *Annual Review of Psychology*, 33, 1-39.

Tajfel, H., & Turner, J. C. (1979). The social identity theory of intergroup relations. In S. Worchel & W. G. Austin (Eds.), *Psychology of intergroup relations* (pp. 33-47).

Monterey: Brooks/Cole.

Taylor, S. E. (1991). Asymmetrical effects of positive and negative events: The mobilization-minimization hypothesis. *Psychological Bulletin*, 110, 67-85.

Triandis, H. C. (1997). Where is culture in the acculturation model? *Applied Psychology: an International Review*, 46, 55-58.

Triandis, H. C. (2001). Individualism-collectivism and personality. *Journal of Personality*, 69, 907-924.

Triandis, H. C., & Suh, E. M. (2002). Cultural influences on personality. *Annual Review of Psychology*, 53, 133-160.

Turner, R. N., Hewstone, M., & Voci, A. (2007). Reducing explicit and implicit outgroup prejudice via direct and extended contact: The mediating role of self-disclosure and intergroup anxiety. *Journal of Personality and Social Psychology*, 93, 369-388.

Turner, R. N., Hewstone, M., Voci, A., & Vonofakou, C. (2008). A test of the extended intergroup contact hypothesis: The mediating role of intergroup anxiety, perceived ingroup and outgroup norms, and inclusion of the outgroup in the self. *Journal of Personality and Social Psychology*, 95, 843-860.

Twenge, J. M., Baumeister, R. F., Tice, D. M., & Stucke, T. S. (2001). If you can't join them, beat them: Effects of social exclusion on aggressive behavior. *Journal of Personality and Social Psychology*, 81, 1058-1069.

Twenge, J. M., Catanese, K. R., & Baumeister, R. F. (2002). Social exclusion causes self-defeating behavior. *Journal of Personality and Social Psychology*, 83, 606-615.

Vallacher, R. R., & Nowak, A. (1997). The emergence of dynamical social psychology. *Psychological Inquiry*, 8, 73-99.

van der Laan Bouma-Doff, W. (2007). Confined contact Residential segregation and ethnic bridges in the Netherlands. *Urban Studies*, 44, 997-1017.

van Gemert, F., Peterson, D., & Lien, I. (Eds.). (2008). Street gangs, migration and ethnicity. Portland: Willan.

van Oudenhoven, J. P., Prins, K. S., & Buunk, B. P. (1998). Attitudes of minority and majority members towards adaptation of immigrants. *European Journal of Social Psychology*, 28, 995-1013.

van Oudenhoven, J. P., Ward, C., & Masgoret, A.-M. (2006). Patterns of relations between immigrants and host societies. *International Journal of Intercultural Relations*, 30, 637-651.

Varshney, A. (2001). Ethnic conflict and civil society: India and beyond. *World Politics*, 53, 362-298.

Verkuyten, M. (2005). Ethnic group identification and group evaluation among minority and majority groups: Testing the multiculturalism hypothesis. *Journal of Personality and Social Psychology*, 88, 121-138.

Viruell-Fuentes, E. A. (2007). Beyond acculturation: Immigration, discrimination, and health research among Mexicans in the United States. *Social Science & Medicine*, 65, 1524-1535.

Voci, A., & Hewstone, M. (2003). Intergroup contact and prejudice toward immigrants in Italy: The mediational role of anxiety and the moderational role of group salience. *Group Processes and Intergroup Relations*, 6, 37-54.

von Neumann, J. (1966). *Theory of self-reproducing automata*. Champaign: University of Illinois Press.

Waddington, D., & King, M. (2009). Identifying common causes of UK and French riots occurring since the 1980s. *The Howard Journal of Criminal Justice*, 48, 245-256.

Wagner, U., van Dick, R., Pettigrew, T. F., & Christ, O. (2003). Ethnic prejudice in East and West Germany: The explanatory power of intergroup contact. *Group Processes and Intergroup Relations*, 6, 22-36.

Waldrop, M. M. (1992). *Complexity: The emerging science at the edge of order and chaos*. New York: Simon & Schuster.

Walks, R.A., & Bourne, L.S. (2006). Ghettos in Canada's cities? Racial segregation, ethnic enclaves and poverty concentration in Canadian urban areas. *The Canadian Geographer*, 50, 273-297.

Ward, C. (1996). Acculturation. In Landis, D., & Bhagat, R (Eds.), *Handbook of intercultural training* (pp.124-147). Thousand Oaks: Sage.

Ward, C., Bochner, S., & Furnham, A. (2001). *The psychology of culture shock*. Hove: Routledge.

Ward, C., & Chang, W. C. (1997). "Cultural fit": A new perspective on personality and sojourner adjustment. *International Journal of Intercultural Relations*, 21, 525-533.

Ward, C., & Kennedy, A. (1992). Locus of control, mood disturbance, and social difficulty during cross-cultural transitions. *International Journal of Intercultural Relations*, 16, 175-194.

Ward, C., & Kennedy, A. (1993a). Psychological and sociocultural adjustment during cross-cultural transitions: a Comparison of secondary students overseas and at home. *International Journal of Psychology*, 28, 129-147.

Ward, C., & Kennedy, A. (1993b). Where's the "culture" in cross-cultural transition? Comparative studies of sojourner adjustment. *Journal of Cross-Cultural Psychology*, 24, 221-249.

Ward, C., & Kennedy, A. (1994). Acculturation strategies, psychological adjustment, and socio-cultural competence during cross-cultural transitions. *International Journal of Intercultural Relations*, 18, 329-343.

Ward, C., & Kennedy, A. (1996). Crossing cultures: The relationship between psychological and sociocultural dimensions of cross-cultural adjustment. In J. Pandey, D. Sinha, & P. Bhawuk (Eds.), *Asian Contributions to cross-cultural psychology* (pp. 289-306). New Delhi: Sage.

Ward, C., & Kennedy, A. (1999). The measurement of sociocultural adaptation. *International Journal of Intercultural Relations*, 23, 659-677.

Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications*. Cambridge: Cambridge University Press.

Weissman, D., & Furnham, A. (1987). The expectations and experiences of a sojourning temporary resident abroad: A preliminary study. *Human Relations*, 40, 313-326.

White, P. (1998). Ideologies, social exclusion and spatial segregation in Paris. In S. Musterd and W. Ostendorf (Eds.), *Urban segregation and the welfare state: Inequality and exclusion in western cities* (pp. 148-167). London: Routledge.

Williams, D. R. (1999). Race, socioeconomic status, and health: The added effects of racism and discrimination. In N. E. Adler, M. Marmot, B. S. McEwen, & J. Stewart (Eds.), *Annals of the New York Academy of Sciences: Vol. 896. Socioeconomic status and health in industrialized nations* (pp.173-188). New York: New York Academy of Sciences.

Williams, C. L., & Berry, J. W. (1998). Primary prevention of acculturative stress among refugees. *American Psychologist*, 46, 632-641.

Wojciszke, B., & Abele, A. E. (2008). The primacy of communion over agency and its reversals in evaluations. *European Journal of Social Psychology*, 38, 1139-1147.

Wolfram, S. (1986). *Theory and applications of cellular automata*. Singapore: World Scientific.

Wolfram, S. (2002). *A new kind of science*. Champaign: Wolfram Media Inc.

Wright, S. C., Aron, A., McLaughlin-Volpe, T., & Ropp, S. A. (1997). The extended contact effect Knowledge of cross-group friendships and prejudice. *Journal of Personality and Social Psychology*, 73, 73-90.

Yaari, G., Nowak, A., Rakocy, K., & Solomon, S. (2008). Microscopic study reveals the singular origins of growth. *The European Physical Journal B*, 62, 505–513.

Yinger, J. (1995). *Closed doors, opportunities lost: The continuing costs of housing discrimination*. New York: Russell Sage Found.

Zagefka, H., & Brown, R. (2002). The relationship between acculturation strategies, relative fit and intergroup relations: immigrant-majority relations in Germany. *European Journal of Social Psychology*, 32, 171-188.

Zagefka, H., Brown, R., Broquard, M., & Leventoglu Martin, S. (2007). Predictors and consequences of negative attitudes towards immigrants in Belgium and Turkey: The role of acculturation preference and economic competition. *British Journal of Psychology*, 46, 153-169.

Zagefka, H., Brown, R., & Gonzalez, R. (2009). Antecedents and consequences of acculturation preferences of non-indigenous Chileans in relation to an indigenous minority Longitudinal survey evidence. *European Journal of Social Psychology*, 39, 558-575.

Zagefka, H., Tip, L. K., González, R., Brown, R., & Cinnirella, M. (2012). Predictors of majority members' acculturation preferences: Experimental evidence. *Journal of Experimental Social Psychology*, 48, 654-659.

Zhang, J. (2011). Tipping and residential segregation: A unified Schelling model. *Journal of Regional Science*, 51, 167-193.

Zick, A., Wagner, U., van Dick, R., & Petzel, T. (2001). Acculturation and prejudice in Germany: Majority and minority perspectives. *Journal of Social Issues*, 57, 541-557.